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A HANDBOOK

OF

THERAPEUTICS.

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BY

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PREFACE.

In preparing a new edition of his Handbook,—specially intended for students and young practitioners,—the Author has endeavoured to make his Work as practical as possible. Therefore he has been content to state the symptom or group of symptoms which may suggest a medicine, and to indicate the way of administering it, and, as a rule, he has omitted the various speculative explanations concerning the mode in which medicines effect a cure.

The present edition has been carefully revised, and much additional matter has been incorporated with it. The Author has again followed Buchheim's arrangement in describing the action of medicines; and in tracing the behaviour of any drug, its effect on the body is noted in the following order:—the skin, the mouth, the stomach, the intestines, the blood, the remaining organs, and finally the elimination of the medicine from the system. While, however, the Author has followed Buchheim's convenient arrangement, it is but right to say that in other respects this Work differs essentially from that of Buchheim.

The Author is anxious to express the great obligation he is under to his friend Dr. George Bird, who has assisted in revising this edition of the Handbook, and has increased its usefulness by many valuable suggestions.

October 1st, 1871.

THERAPEUTICS.

OXYGEN.

Oxygen at present is rarely used in medicine, as no ready way of preparing or applying it has yet been devised. It has been recommended in the non-febrile forms of phthisis, and is said to be of especial service in derangement of the stomach of phthisical patients.

According to Beddoes and Demarquay, in asthma it is useful. They caution against its use if heart disease co-exist.

In anæmia, from loss of blood or suppuration, it is considered by some to increase the appetite and digestion, and so to improve the strength.

Demarquay asserts the remedial power of oxygen over some forms of diabetes, and states that by its employment he has reduced the sugar in the urine by one half, the diet remaining unchanged.

This gas is useful as a local application to atonic painful sores, but produces no effect when applied to healthy ones. In senile gangrene it is said to be of the greatest use. It is administered as a gaseous bath, and its use should be continued for an hour or longer at a time, and be repeated six or eight times a day. The results are these:—the livid red is changed to a rose colour, warmth returns to the tissues, sensation is restored, pain eased, the disease checked and even cured.

ON THE INTERNAL USE OF WATER.

The troublesome pain of toothache may very often be greatly lessened and even removed by rinsing out the mouth for some minutes with water as hot as can be borne; sometimes cold succeeds better than hot water.

Although perhaps not strictly relevant to our present subject, a few remarks may be made on the drinks best suited to fever patients. Thirst to them is most importunate and distressing, and is often the cause of much restlessness and irritability, these in their turn increasing the fever. The thirst must therefore be allayed; but if left to satiate their craving, patients will always drink too much, which excess is very liable to derange the stomach, to impair digestion, produce flatulence, and even diarrhœa. Experience as well as theory shows that drinks made slightly bitter and somewhat acid slake thirst most effectually. A weak infusion of cascarilla or orange peel, slightly acidulated with hydrochloric acid, was a favourite drink for fever patients with Graves of Dublin. Raspberry vinegar may also be used. Sucking ice is very grateful. Sweet fruits, although at first agreeable and refreshing, very often give rise to a disagreeable taste, and are apt to produce flatulence or diarrhœa, and must therefore be taken with moderation and care. There is no advantage in "curtailing beyond a moderate degree the amount of water drunk by diabetic patients. The urine and sugar may by this means be lessened, but the general distress is increased" (Roberts). Prout in such cases recommends tepid drinks.

Water is necessary both for the digestion and solution of food, but an insufficient as well as too large a quantity are alike harmful. It is well known that the character of the fermentations is dependent on the amount of water which is present. For instance, with sugar, if there is too little water, no fermentation will happen; while, on the other hand, if too much, then we have acetous instead of vinous fermentation. It is more than probable that the quantity of water taken with the food may, in a similar way, affect the changes which it undergoes in the stomach. This much is certain, that dyspepsia is often aggravated by drinking habitually with the meals an excess of water, and on the other hand this affection in some cases appears to be connected with an insufficient quantity of fluid. Flatulent dyspepsia can often be traced to excess of drinking at meal-times.

It is easy to understand how too much water taken with the food impairs digestion, by diluting the gastric juice, and so weakening its solvent power. The popular idea proves to be the correct one, that drink should be taken chiefly at the end of the meal, when it serves many useful purposes. Then it aids the passage of the peptones from the intestines to the blood, and by their removal favours the continuance of digestion, it being considered that these peptones hinder that process while they continue in the intestines. Moreover, by drinking water, indigestible substances only partially dissolved, may be carried through the pylorus into the intestines, and be there subjected to further digestion or be eliminated with the motions, and so by their removal from the stomach a source of irritation is prevented. The common modern practice of tea-drinking a short time before dinner cannot be too strongly condemned; several hours ought to elapse between the early tea and the dinner.

But in our desire to avoid the ingestion of too much drink, we must be careful not to err on the side of too great abstinence, since it has been shown that a due amount of water favours the secretion of the gastric juice, and promotes the passage of the peptones into the blood. Iced drinks when taken at meal-times often do harm by constringing the vessels, and preventing the secretion of the proper amount of gastric juice.

Warm water, or various infusions, such as camomile tea and mucilaginous drinks, are employed to promote vomiting after emetics have been administered. The quantity of fluid taken for this purpose should not be too large, or the stomach becomes distended and its muscular walls paralysed, and vomiting is impeded and not promoted. From half a pint to a pint is sufficient.

The action of water in the intestines is similar to that in the stomach, and it is necessary for the absorption of the digested substances in this part of the canal.

A glass of cold water taken early in the morning is to many people a purgative. The cankery taste, hot sensation in the mouth, and lack of appetite for breakfast which many persons experience on waking, may generally be removed by drinking half a tumbler of pure cold water half an hour before breakfast. Diarrhœa is often increased or maintained by a too free indulgence in fluids.

After free water-drinking, the water, but not the solids, of the fæces is increased. Water, tepid or cold, is employed for injections into the rectum, to produce an evacuation from the bowels.

Water passes readily into the blood, but with some limitation. When from any cause its loss from the system has been great, water is absorbed with much avidity, and by its rapid passage into the blood may materially affect that fluid, and, it is said, lead by osmosis to such rapid destruction of the blood corpuscles as sometimes to destroy cattle. But when the amount of water in the blood is already large, the absorption of a further quantity from the stomach and intestines is much curtailed.

Excess of water is eliminated in various ways. Some, as we have said, passes off by the intestines; some is thrown off by the skin and lungs; but most is excreted by the kidneys. The chief part is eliminated in six hours, but after strong exercise much is retained in the muscles for a considerably longer time.

Copious drinking exerts a further action on the urine than that just mentioned; for not only is the urinary water increased, but other constituents, as urea, phosphoric and sulphuric acids, and chloride of sodium.

The augmentation of these, with the exception of the last, is permanent, but with respect to the chloride of sodium it is only temporary, for after a while the quantity of this salt falls below the quantity excreted in health, and thus the previous increase is balanced; and water therefore must, in respect of common salt, be considered merely a temporary eliminator. The case is different, however, with urea, phosphoric and sulphuric acid; for during water-drinking the increase of these is permanent, whence occurs not only an increased elimination, but an increased formation of them, which can happen only from augmented disintegration of nitrogen- and sulphur-containing substances. If water-drinking exerted only a disintegrating influence, it would lead merely to loss of weight; but simultaneously with this rapid disintegration a corresponding increase of assimilation takes place in the same tissues; and so it happens that water taken under certain precautions may increase both construction and destruction of tissue; and so act as a true tonic, improving the vigour of body and mind.

These considerations afford an explanation of the benefit often derived from the "water treatment" in hydropathic institutions.

The effects of water-drinking vary in different people. The disintegration spoken of is greatest in weak people, on whom it may produce an almost febrile state. It is greater in children than in adults, and greater perhaps in women than in men. A high temperature of the water, or of the external air, increases its influence. Bodily exercise has the same effect (Parkes on Urine).

COLD.

COLD, according to the way it is employed, is a refrigerator, a tonic, an excitant, a depressant, or an anæsthetic. In the present place it is proposed to speak in general terms of the effect of cold on the body, and to reserve for a subsequent place the remarks in detail, on ice, cold water, and the various cooling appliances by means of which heat is abstracted from the body.

By the application of cold, heat is withdrawn from the body, and both the surface and deep parts are cooled. By the general cold bath, a very considerable reduction of the heat of the surface may be obtained, reaching 10° Fah. in the trunk, and considerably lower in the extremities. Hence it might be thought that the general cold bath is capable of reducing the heat of the body's surface for a considerable time. This, however, is not the case; for very speedily the heat is restored to the skin of the trunk, although for some hours longer the extremities may remain cold. In a few minutes the temperature in the axilla almost recovers itself, although the bath may have been continued at a temperature of 60° half an hour or longer.

It is not, of course, here maintained that heat is not abstracted from the body; but, as will be shown at another place, this is so rapidly restored, that in health the cold bath is unable to depress the skin's temperature for any length of time.

Cold sponging, so much used, with such great relief in fevers, exerts a very slight and transient influence on the heat of the body, as may be ascertained by aid of the thermometer; hence the sense of comfort experienced by the sponging cannot be ascribed wholly, or even in part, to its refrigerating influence.

This relief may be due to the removal of impurities which may irritate the skin, or annoy by their odour, and by mitigating the parched condition of the skin; for it is well known that a hot dry skin is a source of much greater discomfort than one even hotter, but moist. Sponging the surface with tepid water, by restoring moisture to the parched skin, gives ease and comfort to the patient.

The remarks just made apply only to the surface of the body; but the general cold bath will likewise effect a reduction in the temperature of the internal organs. This reduction, never very great, is restored even more quickly in the deep than in the superficial parts, and, as might be inferred, the general cold bath is still less efficient as a refrigerator of the internal than the superficial organs. The general cold bath therefore, in fever-free people, must rank very low as a refrigerator.

It is however otherwise with the body whose temperature is unnaturally raised by fever, for there is reason to believe that the general cold bath or frequent packing fever-stricken patients with the cold sheet will effect a considerable and durable reduction of the temperature; whether this is accomplished by abstraction of heat, or by preventing its unnatural formation, it is impossible at present to decide.

When judiciously employed, cold is a powerful tonic. Its effects in this respect are well known. A cold climate and cold bathing are tonic and bracing. The explanation of its action in this respect is probably found in the following considerations. During exposure to cold the loss of heat from the body, as tested by the thermometer, is by no means a measure of the quantity withdrawn. It has been shown by many observers, that at such times increased combustion occurs, whereby much of the lost heat is compensated, and the temperature maintained or soon restored. This increased oxidation of the tissues is demonstrated by the greatly increased quantity of carbonic acid thrown off by the lungs on exposure to cold. This increased oxidation it is which probably explains the tonic effects of cold, and in the following way :—The most vigorous health is best maintained by a rapid construction and destruction of tissues within certain bounds, provided these two processes are equally balanced. By exposure to cold, more oxygen is absorbed by the lungs, and more oxidation of the tissues results, thus greatly promoting the processes of destruction and reparation. How is this effected?

In nutrition, apart from the nerves, we have three factors, the nutritive plasma, the tissues, and oxygen. When food is taken, digested, and introduced into the blood, both formation and destruction of the nitrogenous tissues begin. Formation is limited by destruction. When the destruction of tissue ceases, the further assimilation of the nutritive materials of the blood comes likewise to an end. These destructive changes take place in proportion to the amount of oxygen absorbed. When this gas is exhausted, many products of destruction remain only partially oxidized, further disintegration of the tissues ceases, and assimilation is suspended (Parkes).

Under exposure to cold, oxygen being abundantly absorbed, the effete products in the blood are first consumed, and that important fluid is purified, and more fitted for the nourishment of the body; next, by its consuming action on the tissues, oxygen promotes the cycle of changes described, and food is taken and assimilated, and thus destruction and construction of the tissues proceed rapidly, creating great physical vigour. Thus it is that cold climates are invigorating.

When applied locally, cold may act as a local tonic (see Douche); but if too long continued, or if the cold is excessive, it depresses the part; for, by contracting the vessels, it lessens the supply of blood to the tissues, and thereby diminishes in them cell growth and tissue change. If the intense cold is applied for some minutes, and all function in the part ceases, sensation is lost. Cold thus applied becomes an anæsthetic. If such a cold application be too long continued, the part dies and becomes gangrenous.

Suddenly and locally applied cold may act as an excitant, as is shown by the following examples :—

The cold hand applied to the abdomen excites contractions in the parturient womb. A few drops of cold water sprinkled over the face is a popular way of exciting breathing, and restoring consciousness to a swooning person. The same treatment is employed to establish breathing in weak or still-born children, or in persons over-dosed with chloroform, or in the narcotism from opium or drink.

After these general remarks on the effects of cold, we shall speak next in detail of the employment of cold water, as in the common and sea bath, shower bath, the douche, and cold affusion.

COLD BATHS.

Cold water may be employed on account either of its moisture, its temperature, or both. If we require merely moisture, and temperature is of no consequence, tepid or warm water is both preferable and more agreeable. Cold water is generally employed to abstract heat from the whole surface of the body, or from some particular part of it, or to produce general or local excitement and shock.

As the skin absorbs neither the water of the bath, whether it be warm or cold, nor any substances, soluble or insoluble, which may be added to the water, it follows that whatever bodily effect baths may produce, must be explained by their direct action on the skin.

In our remarks on the general cold bath we shall speak mainly of cold sea-bathing, this being a far more powerful medicinal agent than the general simple cold bath, although the action of both is identical, the difference being one merely of degree. As we proceed we shall point out in what respects they differ, and how these differences affect the body.

On entering a cold sea bath a feeling of depression is experienced, great or little, according to the coldness of the water. The skin grows pale and shrivelled, and presents the appearance called "goose skin," produced by the contraction of the skin, and the consequent protrusion of the hair roots and follicles. There is general shivering, with some blueness of the lips, nose, and prominent parts of the body. The temperature of the skin is considerably reduced; the pulse is quickened; the breathing becomes convulsive and sobbing as the water rises to the chest, especially if the bath is entered slowly. The system soon becoming roused to meet and resist the depressing effects of cold, in a few seconds a feeling of general exhilaration ensues. The skin becomes ruddy, and glows. The breathing is full, frequent, and easy; the pulse rather quick and strong; the spirits are exalted, and the bather feels increased vigour, both of mind and body. If now he quits the bath, or before the period of exhilaration ceases, this buoyant condition remains more or less for the rest of the day, and the bath thus acts as a tonic to the system.

On the other hand, should the bath be prolonged, depression again supervenes. The bather feels cold, shivers, becomes blue and numb in the more exposed and smaller parts, whence, on account of their size, warmth is more readily withdrawn. A feeling of depression and wretchedness seizes him. Baths prolonged to such consequences often produce disagreeable results, which may continue for hours, and even days, inflicting serious damage to the health, the greater if the patient is weak or growing. For many hours after the bath he complains of general languor, with a repugnance to exercise, whether of body or mind. His temper is fretful and irritable. His circulation is feeble and languid. He suffers from sinking at the epigastrium, with loss of appetite, chillness of the surface, with cold extremities. It need scarcely be said that such consequences are to be most carefully avoided; yet, unless minute directions are given, so great is the ignorance and error which prevails amongst the laity on the subject of bathing, these evils will be encountered.

If the exposure to cold, as in the cold bath, is continued beyond this point, or if the cold is severe, great depression and a feeling of misery set in, followed shortly by heaviness and drowsiness, which deepen into coma, till a kind of apoplectic state is reached, and asphyxia from paralysis of the muscles of respiration ensues, and consequently death.

It would thus appear that baths, on the one hand, are most powerful tonics, while, on the other, if wrongly used, they cause great depression of the bodily powers, and produce serious mischief. The good offices effected by sea baths have been placed beyond mere surmise; for it has been established by direct experiment, that a sea bath acts altogether more powerfully on tissue metamorphosis than the simple water bath; that while the process both of destruction and construction of tissue is increased, construction is augmented in excess of destruction, so that there results an actual increase in weight as well as an increased vigour of the functions of the body. Since sea air acts in the same way, it is difficult to determine to what extent improved health results from sea climate or sea baths.

The cold bath is almost universally employed for its tonic virtues. To obtain this wished-for result, the bath should be discontinued at the time it causes general exhilaration, for the system then appears to be roused into action to resist the depressing influence of cold, and this general healthful stimulation, if the bath is now discontinued, remains. For, whilst taking the bath, and probably for some time afterwards, oxidation of the tissues is increased. The blood is purified of effete products, and the construction and destruction of tissue, on which vigour of both mind and body depends, are heightened.

Bathing therefore increases appetite, improves digestion and the assimilation of food.

The bath, then, in the strictest and fullest sense of the word, is a tonic.

Used in accordance with the rules to be immediately laid down, the good effects of the bath become soon apparent in the improved condition of the patient. He gains in weight; his complexion becomes ruddy and clearer; his muscles, especially if exercise is conjoined, gain in firmness and strength. If, from deficient nutrition of the nervous system, he suffers from any impairment of the mind, this speedily improves, and he is soon restored to mental vigour and good health.

The important question arises, How can we best obtain these invigorating effects of baths?

Our object is to secure the greatest amount possible of stimulation, and to ensure the continuance of the increased vigour of nutrition as long as possible. This last result is obtained, as we have seen, by leaving the bath at the time of general exhilaration and stimulation, and before the next stage, that of depression, begins. To obtain the greatest degree of stimulation we must duly apportion the temperature and duration of the bath to the strength of the patient.

If very weak, the patient manifests but little functional energy to resist the depression from the cold. If this is intense, there may be no stage of stimulation, but the patient, from the first depressed, may remain so for a long time. Weak persons are thus often seriously injured, and their lives even endangered, by cold bathing.

The depressing effects of a cold bath are proportioned to its coldness and duration. The colder the water, the greater depression it occasions. This is also greater when the water is in motion than when at rest. Moreover, the longer the bath is continued, the greater is the depression it produces.

Thus, in giving directions concerning sea-bathing, we must have regard to the strength of the patient, the temperature of the water, and the duration of the bath.

If the patient is weak and much prostrated by previous illness, the bath must not be too cold, nor continued too long, and the water should be at rest.

It will here be convenient and profitable to consider in what respect sea differs from simple water baths, and to explain the superiority of sea baths as a tonic.

1st. In sea water we have various ingredients dissolved.

2nd. The variations in its temperature in the varying seasons of the year are much less than those of river water; and, lastly, while the sea is always more or less in motion, river water is comparatively at rest. The salts in solution are supposed to act as invigorating stimulants to the skin. Hence it happens that patients who cannot bathe in simple water without suffering great depression, can bathe in sea water with great benefit. Moreover, as the temperature of the sea never falls very low in winter, sea-bathing may often be continued late in the autumn, or even into the early winter months.

The motion of the waves increases the depressing effects of the bath; but if the bather is strong enough, it also increases the ensuing reaction; and thus, while more exhilarating to the strong, it is at the same time highly agreeable.

If we keep these guiding principles in mind, we shall at all times be able to give correct answers to the various questions patients may put to us concerning bathing. One most frequently asked by a patient about starting for a watering-place is, How long shall the bath be continued?

Our answer must be regulated by the strength of the patient and the coldness of the water. If the water is cold, or the patient very weak, out-door sea-bathing must at first be forbidden, and a tepid bath substituted, the temperature of which should be slowly reduced until that of the sea is reached. Then, if the day is fine and the sea calm, the bath may be taken in the open air. Should it be considered safe for the patient to bathe in the sea, yet if he is very weak and unaccustomed to bathing, the stay in the water must be very brief. Often it will suffice for a weakly person to allow two or three waves to pass completely over him, and then at once to quit the water, and wipe himself thoroughly dry, using plenty of friction to the skin. As strength increases, and he becomes accustomed to the effects of the water, the bath may be continued for a longer time, but it is seldom advisable for a convalescent to bathe longer than from five to ten minutes.

Then as to the time of day best suited for bathing. On this subject the greatest ignorance prevails. It is currently believed to be best to bathe before breakfast. Yet this practice has risks even for the robust, who are often made very ailing and fatigued for the rest of the day.

As we have before said, our object in using the bath is to obtain as much and as prolonged stimulation as possible. We must therefore choose that time of day when the body is most refreshed, invigorated, and nourished. All these conditions, it might be thought, exist during the early morning hours after a sound and refreshing sleep. It must be recollected, however, that before breakfast the body has undergone a prolonged fast of several hours, and is in want of food, without which the bodily functions may be very readily depressed. Theory and experience thus speak against this hour of the day for bathing, and both point to a time between breakfast and dinner as most appropriate.

This leads us to the consideration of another question; namely, after a meal, how long a time should be allowed to elapse before a bath may be taken; and, after its use, what time should pass before food should be taken. Cold bathing produces a great shock to the skin and system generally. Any powerful mental or bodily impression is sufficient to arrest, or to check for a time, many of the functions, even if they are in active operation. This is the case with digestion. Any great excitement, as is well known, can stay this process more or less completely, and the cold bath is generally sufficient completely to arrest it; therefore a sufficient time should be allowed to elapse before the bath is taken, to permit the almost complete digestion of the breakfast, that is, an interval of about three hours. Nor, for the reason just explained, should the bath be employed immediately before a meal; or, if this rule is broken, little or no gastric juice is secreted, and food lies half-digested in the stomach.

And for a reason somewhat similar, the bather should not be under the influence of any great emotional excitement, whether pleasant or painful. At such times the nervous force of the system (on which there appears to be set a limit) is directed strongly in one channel, and no nervous stimulation follows on the application of the bath. Bathers thus excited are often made languid, cold, shivering, and much depressed. Obviously for the same reason children must be coaxed, not dragged against their will, into the water. In early life there is often much terror of bathing. If, in spite of this, the child, while screaming with fright, is forcibly dragged into the sea, very ill effects may follow; for, no stimulation occurring, the child may remain often for days depressed and ill.

Is there any age rendering sea-bathing dangerous, and to be prohibited?

Young children,—for instance, under two years of age—being very impressionable, it is generally accepted that they should not undergo the shock of cold sea baths. At the other extreme of life, when the powers of the body are enfeebled and incapable of very active reaction sea-bathing is inadmissible. The power to form heat, as is well known, is very much reduced in old people. Moreover, undue vascular excitement may prove dangerous; the vessels in the old, being often brittle from degeneration, are in danger of giving way, and causing apoplexy, if any unusual strain is brought to bear on them.

From the foregoing remarks it will have been gathered that fatigue is a condition strongly adverse to cold bathing. It is seldom advisable for weakly persons to take a bath on the day following their arrival at their destination, even if other conditions should be favourable. It is advisable to wait till all fatigue is recovered from.

Does pregnancy forbid sea-bathing?

If a woman has had several miscarriages, or has aborted, or if of an excitable temperament, or if pregnancy is far advanced, then baths may be expected to do harm, and to produce abortion. But under other circumstances, and with due regard to the conditions laid down, both mother and child will be benefited by bathing. Nor, if she has been accustomed to the practice, need a woman discontinue bathing at the menstrual period, although it is always inadvisable to begin the use of this agent at such a period, as the shock may check or arrest the secretion, and thus produce, perhaps for many months, amenorrhœa.

In the choice of coast, and the time of year, we must have regard to the vigour or debility of the patient. If not very weak, the health being only a little injured, then a rugged coast, where the sea is rough and boisterous, should be recommended as both profitable and agreeable to the bather. However, should the health be much broken, then a smooth sea is preferable, and, if the climate be a cold one, the summer months are the only suitable time.

Exercise taken while bathing soon induces fatigue and even exhaustion; wherefore patients, if weak, must be cautioned in this respect. Another evil should be guarded against: on leaving the bath, invigorated by it, a patient is in danger of taking too much and too active exercise, thus unduly fatiguing himself, and so undoing its good effects. The amount of exertion permitted must be strictly in accordance with the patient's condition, who, if weak, should take only horse or carriage exercise.

During a course of sea-bathing, the hair not uncommonly falls off, which naturally excites much anxiety, especially in women; but their fears may be quieted by the assurance of its growth in greater luxuriance than ever. Other troubles may arise. For instance, it may happen that constipation, more or less obstinate, follows on bathing: but this need not lead to the discontinuance of the bath. The constipation should be removed by exercise, a regulated diet, and, these failing, by purgatives. Greater troubles, dyspepsia and diarrhœa, sometimes occur during sea-bathing. The bather's habits, as the hour of the bath, the time spent therein, and other particulars must be examined into, and any indiscretion cautioned against; yet, notwithstanding every care, in every particular, dyspepsia or diarrhœa, or both, may happen; in which case the bathing must be discontinued, temporarily or permanently. With some the sea air even is sufficient to produce these troubles.

Restlessness at night is another untoward symptom sometimes attributable to sea-bathing. Many individuals, no doubt, find that living too near the sea's edge often produces broken, sometimes sleepless nights. On the shores of the Mediterranean, especially along the Riviera, this is notably the case. On removal inland, a mile or thereabouts, this restlessness vanishes. Broken rest may often be traced to dietetic irregularities, or to the hours of retiring to rest. A late and heavy meal will sometimes cause restlessness, which ceases to recur on the substitution of an early, light, and easily digestible one.

Some patients mar their rest by taking stimulants shortly before bedtime, while, on the other hand, others cannot sleep without taking some "night-cap" stimulant.

Bathers should plunge into the water at once, and not stand hesitating till they become cold and shivering, a state which should be carefully avoided. If needful, a short brisk walk should be taken just before the bath, to warm the surface and extremities.

Simple and Sea-water Cold Baths.—The effect of cold is to lessen in proportion to its degree the perspiration. A cold bath checks cutaneous secretion at first, but soon afterwards this secretion is considerably augmented, and more so after sea than after simple water-bathing. Driven from the skin, the blood flows to the internal organs, and congests them. The kidneys partaking of this congested state, explains probably the general occurrence of a small quantity of albumen detectible in the urine during the bath; after the bath, the albumen speedily disappears.

The effects of cold baths on tissue change have already been pointed out, and those statements will receive confirmation in the remarks now to be made, relating to the influence of sea baths on the constituents of the urine. Baths augment the quantity of urea and sulphuric acid of the urine. It has been doubted whether this increase is beyond the limits of the natural variations of health, and whether the experiments are sufficiently numerous to prove the point in question. It is not to be expected that the increase of tissue change would at once be very greatly augmented, nor that at any time it would be increased beyond the maximum amount of health; consequently the increase of urea in its turn would not exceed the maximum quantity of health. But surely if the amount of urea is for some time maintained at its maximum, this alone would prove the influence of baths, so far as they could be expected to operate, and would show that sea-bathing increases disintegration of the nitrogenous tissues.

The power of sea baths to promote tissue change, and increase the separation of urea by the kidneys, may be demonstrated in another way.

The increased consumption of food induced by the use of cold baths must either be stored up in the body or be separated as urea by the kidneys. Now although the weight of the individual who takes the bath undoubtedly increases, still this is not commensurate with the increase of nitrogenous matters ingested; there must be, then, an additional separation of urea by the kidneys while these baths are used; but if the prevalent idea is correct, that all baths must either be stored up in the body or be separated as urea by the kidneys. Now although the weight of the individual who takes the bath undoubtedly increases, still this is not commensurate with the increase of nitrogenous matters ingested; there must be then an additional separation of urea by the kidneys while these baths are used; but if the prevalent idea is correct, that all nitrogenous matters must first be transformed into tissue before they can be disintegrated and reduced to urea, it follows that tissue change is likewise promoted by sea-bathing.

Beneke's observations lead to the same conclusion. When just sufficient food was taken to maintain the weight of the body at a fixed point, he found that if baths were taken then the body immediately lost in weight, which loss must be due to heightened disintegration of the tissues. But this increased consumption was accompanied by increased appetite, and by increased assimilation, so that when more food was taken the body gained in weight. Baths, it is said, increase the quantity of uric acid, although this is lessened by sea air; but on this point observations are as yet insufficient.

The urinary water is temporarily and often greatly increased, but the whole day's urine is lessened in quantity, probably from the subsequent excessive elimination by the skin. In Beneke's observation the intestinal secretions were also large, and some water may have escaped in this way.

It is scarcely necessary to occupy much space in a description of the cases in which sea-bathing may be usefully employed. In chronic illnesses, with debility, sea baths will yield the best results; but it is useful especially to convalescents from acute diseases, to those whose health has been broken by over-work, by residence in towns with a too sedentary employment, or injured by excesses of various kinds. It is a question of much importance whether phthisical persons should take sea baths, and our answer must be qualified by the circumstances of the case. When the disease is chronic, the temperature being but little or not at all elevated (little or no fever), when indeed the case is one of fibroid degeneration of the lungs, without active deposition of tubercle or scrofulous pneumonia, seabaths may be given, due regard being paid to the rules laid down.

SHOWER BATHS.

The forcible impact of water upon the body, and the impression it makes on the nerves, or, to use the general expression, the shock it produces, is sometimes very great, being sufficient often to produce considerable depression and languor for many hours, sometimes days, even when the bather is strong and healthy.

It is a remedy not much used, patients, indeed, generally manifesting great repugnance to the shower bath. The sponge bath, or the local douche, may in general effectually supply its place.

In the sponge bath we have presented all the conditions of the common bath. Like it the sponge bath is cleansing, bracing, invigorating; and their action on the body is identical.

It is often employed, not merely for its tonic effects, but on account of the shock it causes to the nervous system.

Laryngismus stridulus is more successfully treated by cold sponging than by any other means. The practice of confining little children to the house in a warm close room, sousing them in warm baths several times a day, is a most injurious plan, and inevitably aggravates the severity and frequency of the crowing breathing. No matter how severe the attack, the practice of cold sponging twice or thrice daily, according to the severity of the case, will scarcely ever fail at once to influence the disease. So prompt is its action, that children in whom the attacks occur perhaps hourly during the day, and even oftener at night, are frequently instantaneously freed from them. At all events, a decided improvement always occurs, the intervals being much prolonged; and it rarely happens that the complaint resists this treatment more than two or three days. The mother should be directed to keep the child out of doors for the greater part of the day, no matter how cold the weather; indeed, the colder the better. Children attacked by laryngismus are seldom more than a year old, and at this tender age it might be thought that they would be in great danger of catching cold from the foregoing treatment; but no such fears need be entertained. With proper precautions the youngest children may be sponged with perfect safety several times a day. Nor do they catch cold even in the coldest weather when carried out of doors; but children prone to bronchitis had better be kept indoors when the weather is very severe, and should undergo only the cold-water sponging. After a very extensive experience of this treatment the author has rarely witnessed the simultaneous occurrence of a cold in children suffering from laryngismus; and then the catarrhal symptoms were insignificant.

Dashing cold water over the child is the surest and speediest way of arresting a paroxysm of crowing breathing. At the onset of a paroxysm cold water should be dashed on the child's face; and if this does not at once arrest the attack, the water should be applied to the whole body. When promptly used, this treatment frequently saves the child's life; for laryngismus, when fatal, destroys the child by exciting an attack of general convulsions, arising from asphyxia produced by prolonged closure of the glottis. At certain times of the year laryngismus is one of the most common causes of convulsions, which not uncommonly prove fatal. Cold sponging, by removing the spasm of the glottis, arrests the attack of crowing, and by this means obviates that degree of asphyxia which might excite convulsion. Fortunately laryngismus is more common in the early spring, and at a time, therefore, when the cold weather affords a ready source of cure. As it commonly happens that laryngismus is cured at once by this treatment, and rarely lasts more than a few days from its commencement, it is obvious that it does not act as a mere tonic, although in this respect it is very useful, because laryngismus generally attacks weak, sickly, and rickety children.

Any irritation aggravates laryngismus, and impedes its cure. Hence, if the relief from cold sponging is less marked than might be expected, some source of irritation should be sought for and removed. The gums, if swollen, red, and hot, must be freely lanced and the openings maintained, for if the cuts close up, the irritation returns; thus it is commonly necessary to lance the gums several times, at a few days' interval. Worms must be removed, and the state of mucous membrane favouring their production treated. As each tooth is cut, some laryngismus will frequently recur, in spite of cold sponging, although this will always prevent the relapse becoming severe. When the tension of the gums is removed, and the tooth set free, the fit ceases.

In the treatment of chorea, cold sponging, repeated several times a day, holds also deservedly a very high place. Whether its good effects are due solely to its tonic properties, or whether the shock plays any part in promoting the cure, it is at present impossible to decide. Of the usefulness of this treatment there is no question, yet circumspection must be exercised, or the patient may be made worse by it instead of better. It must be avoided if there is any rheumatism, which is generally made worse by cold sponging, thus inducing an increase of the choreac movements. If there is no fever, and no pain in any of the joints, then the cold sponging may be reasonably expected to yield most satisfactory results. In the treatment of rickets, cold sponging, by virtue of its tonic properties, holds a very high place. Here again care must be observed, or we may do the child much harm. Such patients, we must remember, are not only often very weak, but are very impressionable on account of their tender years, and for these reasons it is of the highest importance to adapt the application of the cold sponging to the condition of the patient.

The method adopted by the author is the following:—If old enough to stand, he directs the child to be placed up to the ankles in warm water before a good fire. The child is then to be sponged all over, except the head and face, for a time varying from two to five minutes; after which the skin is to be carefully wiped dry and well rubbed with a soft towel. If weakly, the child may be placed for a short time again in the warm bed, by which the reaction, as it is termed, is promoted. The sponging should be administered to the child as soon as it leaves its bed; but if very weak or unaccustomed to the sponging, it is advisable to give a light and early breakfast about an hour beforehand. There is another excellent method of administering cold sponging to weak persons or to timid children, and therefore a plan to be adopted when this agent is used in the treatment of chorea. The water should at first be tepid, then its temperature should be gradually reduced by drawing off the warm and substituting cold; so we avoid the shock, but obtain the tonic effects of the bath. This method succeeds admirably with children, who are often much frightened by the bathing, and sometimes scream so violently as to lead the friends to fear an attack of convulsions.

Adult persons with impaired health may do much to restore it by the use of cold sponging. It is useful in anæmia, leucorrhœa, amenorrhœa, spermatorrhœa,* and in that nervous state which some men suffer from who work in hot, close, ill-ventilated rooms or during the night, etc., etc.

If the weather is cold, the water should at first be made a little warm, afterwards lowering the temperature daily. The depressing effects on the weak can generally be prevented by taking a little light food about an hour before the bath, and by returning to bed for half an hour after its completion, to restore warmth to the skin and extremities.

Before closing this subject, it may be useful to advert to a condition, not uncommon in infants, which may be remedied or even removed by cold sponging, repeated night and morning. An infant has its health impaired by frequently waking up at night from "a catch in the breath." For some unexplained reason, it cannot for a time get its breath, and wakes up with a loud snore. This is a condition altogether different from that of laryngismus stridulus, for the fault appears to lie in the soft palate, not in the larynx. It is moreover not due to enlarged tonsils, as this phenomenon occurs in children of tender age, long before this morbid condition takes place.

Affusion and the Douche.—Cold water thus applied impinges on the body with considerable force, and the resulting nervous impression is correspondingly great. With the douche the water is directed against the body in a large stream, and sometimes it is applied to every part of the surface in succession. The depression it produces is too great to admit of the frequent employment of this application. Generally it is modified, and the cold affusion is used in its place, cold water in pailfuls being dashed over the surface of the body. This application is recommended for persons struck down and unconscious by sunstroke. Many years ago affusion was employed in the treatment of the acute specific fevers, and was especially recommended in scarlet fever. This mode of treatment comes to us sanctioned by the authority of many of the ablest medical men of the past generation. Yet in the present day the reaction against all energetic treatment is so great that this means is now very rarely adopted. Fears are expressed lest serious consequences should ensue; but if the affusion is employed at the right period of the disease, no apprehensions need be entertained. The experiences of Currie and Jackson abundantly testify to this. The time for its use is during the first few days of the fever, when the skin is hot and the rash bright red.

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* In spermatorrhœa and in varicocele it is useful to suspend the testicles in cold water once or twice a day, for a few minutes.

The patient should be stripped, and four or five gallons of very cold water should be dashed over him; and when the heat of the surface returns, this process may be repeated again and again. Under this treatment the fever diminishes, and is sometimes, it is stated, even extinguished.

The cold bath, or packing in the cold sheet, several times daily, according to the height of the fever, may be substituted for the cold douche.

The douche and affusion are generally employed for their local effects. To arouse persons from the stupor of drunkenness, or that of opium poisoning, they are of the greatest service, being unequalled by any other treatment when a certain stage of the poisoning has been reached. When taken in too large quantities, these agents induce stupor more or less profound; then the movements of respiration, at first languidly performed, soon stop, and thus death by asphyxia results.

At this most critical stage, cold affusion, or the cold douche, applied freely to the head, is generally sufficient to remove within the skull the conditions on which the stupor depends, and to restore the consciousness, when simultaneously the breathing again becomes natural, and for a time the fears of a speedily fatal termination are removed. The water should be poured on the head from a good height, so as to obtain as great a shock as possible. The pulse and general state of the patient should be watched, and the vigour of the application must be regulated by the information obtained from these sources. The breathing becomes deeper and more frequent, the lividity and bloated aspect of the face soon disappears, while the pulse grows in strength. It may, and does, indeed, often happen that relapses occur, when the affusion must be again and again employed, so as to sustain life long enough to admit of the elimination of the poison. If promptly and efficiently applied, even in the most unpromising cases, life may be saved. It is all important that the water should be abundantly applied for some time, and from a good height.

Some time may elapse before any good effects become visible, but if the pulse and breathing improve, or continue as they were before the douche was tried, its application should be continued, and perseverance will often be rewarded by success. Many cases of furious maniacal delirium may be quieted by the cold douche. It must be borne in mind that the douche is a powerful remedy, which makes it necessary to watch most carefully its effects on the strength of the patient. An excellent method of applying the douche, to obviate excessive depression, is to place the patient in a warm bath, and apply cold to the head in the manner described above.

The severe pain in the head, met with in the acute specific fevers, or that resulting from gastric disturbance, is relieved most gratefully and effectually in the way recommended by Dr. Hughes Bennett: "A washhand-basin should be placed under the ear, and the head allowed to fall over the vessel, by bending the neck over the edge. Then from an ewer a stream of cold water should be poured gently over the forehead, and so directed that it may be collected in the basin. It should be continued as long as agreeable, and be repeated frequently. The hair, if long, should be allowed to fall into the cold water, and to draw up the water by capillary attraction." He agrees with Graves, that in some cases very hot water acts more successfully than cold.

The cold douche is also an excellent tonic to individual parts of the body. It may be employed to remove that stiffness in joints remaining after slight injuries, or resulting from rheumatism or gout. Salt may advantageously be added to the water. The force of the douche's impact on the affected part, with the duration of its application, must be regulated by the conditions of the tissues. If very weak, it is better at first to play the water in the neighbourhood of the injured or weakened joint. In spermatorrhœa much good may be effected by the free application of cold water to the perinæum and buttocks several times a day, and by the suspension in cold water of the testicles for a few minutes night and morning. The same treatment is useful in varicocele.

Injections of cold water night and morning into the vagina may be most profitably employed to prevent the recurrence of leucorrhœa after it has been checked by appropriate treatment. A cold-water injection every morning before going to stool cures piles in many cases, and is always a useful addition to other treatment. Many persons, especially women, are troubled with cold feet. This ailment, most common at night, and often preventing sleep for many hours, is best treated by immersing the feet nightly, for a few minutes, in cold water, rubbing them whilst in the footbath diligently with the hands until they become warm and glowing, when they should be clothed in thick overlarge woollen socks.

THE TURKISH BATH.

This bath combines many of the properties of the hot and cold bath. It is used for its bracing and depurating effects. The body, subjected to great heat, is made to perspire copiously. If the bath ended here, more or less weakness would ensue; but at this stage cold water is freely applied, whereby the body is braced, its functions stimulated, and the tonic effects of the cold bath are obtained. The Turkish bath, at each stage of the process, cleanses the system; the perspiration carrying off, and the cold consuming, by increasing oxidation, many effete and noxious substances in the blood.

Dr. Goolden recommends these baths in gout, rheumatism, sciatica, Bright's disease, eczema, and psoriasis. He asserts that they benefit bronchitis, the cough of phthisis, the aching of muscles from unusual exertion, pains in the seat of old wounds, colds in the head, quinsies, and common winter coughs. The disposition to catch cold may be obviated by a course of these baths; the cold sponge bath, and packing with the cold wet sheet, may be employed for the like purpose.

It is not amiss here to caution persons prone to colds, that the general habit of over-clothing increases this disposition. This cold-catching tendency may be obviated by using a moderate amount of clothing, and taking a cold sponge bath each morning, or the Turkish bath once or twice a week.

Acute rheumatism and acute gout have been treated with these baths; but as in most instances the severity of the pain renders it impracticable to take these patients to a Turkish bath, a modified substitute for it, shortly to be described, may be taken at their own homes. It is said that the acute pain of gout disappears in the hot chamber, to return in a diminished degree soon afterwards.

In subacute and chronic gout the Turkish bath is particularly valuable, but, as might be expected, it is not equally serviceable in all cases. Where the disease is of long standing, and the attacks have occurred so frequently as to distort the joints by deposits, and where the patient is perhaps liable to repeated relapses, and is scarcely ever free from pain, the efficacy of the bath, though striking, is less apparent than in milder and more tractable cases; yet even in these cases, by diminishing the frequency and severity of the relapses, and by removing that feeling of invalidism, it affords considerable relief. The Turkish bath is perhaps superior to other remedies in cases of the following kind:—A patient complains of slight and fugitive pains; the joints, but little swollen, are merely stiff, and a little red and hot. The gout often affects many parts in succession—the joints, the head, the back, and perhaps some of the internal organs, as the bladder, etc. During an attack the patient complains of a feeling of *malaise*, and his complexion often becomes dullish. Such a patient is often inclined to stoutness. The tissues may be soft and flabby, and in spite of judicious diet and abundant exercise he may be seldom free from some evidence of gout, sufficient to annoy but not to disable him for work. In a case like this the Turkish bath is of great advantage. After one or two baths the pains, the swelling, the feeling of *malaise*, disappear, the joints become supple, and after a time, the baths being continued, the complexion loses its sallowness, while the tissues become firm, and undue stoutness is diminished. On discontinuing the baths, the gouty symptons will often recur, to disappear again on the resumption of the treatment. Gouty patients may with advantage supplement the action of the Turkish bath by drinking certain natural alkaline waters.

The Turkish bath is useful in the various kinds of chronic rheumatism.

Mr. Milton has found the bath useful in allaying the tormenting itching of prurigo, unconnected with lice.

It may happen from various circumstances that the regular Turkish bath is not available, when one or other of the following modifications of it may be substituted:—the patient, quite naked, seated on a wooden chair, with his feet on a low stool, is enveloped in two or three blankets, the head alone being exposed, and a large-wicked spirit lamp is placed under the chair. In about a quarter of an hour perspiration streams down the body, and this secretion may be increased by drinking plentifully of water, and by placing a pan of water over the lamp. When the patient has perspired sufficiently, the blankets are quickly removed, and one or two pailfuls of cold water are poured over him. This treatment Dr. Taylor, of Nottingham, finds useful in obstinate skin affections, rheumatism, catarrh, syphilis, and in removing stoutness arising from an inactive life.

Dr. Nevins highly recommends the following contrivance in the treatment of acute rheumatism. "It consists of the employment from the very first of steam baths, even when the patient is so helpless that it is impossible to move him from the bed on which he is lying. These steam baths relieve the pain, and check the distressing perspiration, in a degree he has failed to obtain by any other mode of treatment. They are administered with the greatest ease in the following manner:—A couple of common red bricks are to be placed in an oven hot enough for baking bread, and in half an hour or little more they are sufficiently heated for the purpose. The patient's body linen having been previously removed, these two bricks are to be folded up in a piece of common thick flannel, thoroughly soaked in vinegar, and laid on two plates; the one is to be placed about a foot distant from one shoulder, and the other about equally distant from the opposite leg, and the bedclothes are then to cover the bricks and the patient closely round the neck. A most refreshing acid steam bath is thus obtained; and the supply of steam may be kept up, if necessary, by removing one brick and replacing it by another hot one kept in reserve. When the patient has been in the bath for fifteen or twenty minutes, the bedclothes and plates should be removed, and *the patient instantly mopped all over, very rapidly, with a towel wrung out of cold water*, and then should be quickly rubbed dry. Dry warm linen must be put on at once, and dry bedclothes must replace those which were on the bed previously. The under sheet can be removed, and a dry one substituted, by fastening the corners of the dry sheet to those of the damp one; very little difficulty is generally met with in simply drawing the old sheet from under the patient, when the dry one follows it, and is left in its place. The patient generally experiences great and speedy relief from this bath. The exhausting sweats are usually diminished, and the necessity of opium much lessened. The change of body linen can be easily accomplished by tearing the night shirt open from top to bottom, down the back. The steam bath and subsequent cold douche should be continued after the patient is able to walk about, as they contribute to the healthy action of the skin, and promote free mobility of the joints." After the patient is able to rise from bed, the bath may be administered in the manner previously described.

ON PACKING WITH THE COLD WET SHEET.

Packing with the cold wet sheet, although at present but seldom employed, is undoubtedly a very efficacious treatment in many diseases.

In his work on hydropathy, Dr. Johnson recommends a mattress for the patient to lie on, with a pillow to support his head; "upon the mattress, and extending over the pillow, two blankets are spread, and over this is spread a sheet wrung out as dry as possible with cold water. The patient lies down on his back, perfectly unclothed, with his head comfortably placed on the pillow, an attendant now approaches, say on the patient's left, and first puckering the blanket from the back of the head down to the back of the neck, reaches across his chest, seizes the right upper corners of the blanket, and brings them tightly across under the chin to his own side (the left), and tucks them well and evenly under the left shoulder, where it joins the root of the neck, and under the point of the same shoulder. He now reaches across the body again, and brings over all the rest of the right sides of the blankets to the left side of the patient, and then proceeds to tuck them well and evenly under the left side, beginning where he left off at the point of the left shoulder, and proceeding quite down to the heels. The patient is now entirely enveloped in one half of the blankets, and the attendant finishes the operation by passing over to the right side of the patient, and then proceeding to tuck the left sides of the blanket under the right side precisely in the same manner as we have seen him tuck the right sides of the blanket under the left side of the patient. The attendant, standing on the right side of the patient's legs, finally insinuates his left hand under the backs of the ankles, lifts them up, and then with his right hand turns back the lower ends of the blankets under the heels." The wet sheet should reach to the ankles, and "be wide enough to overlap in front of the body about eight or twelve inches; over the whole, four or five blankets are placed, and pressed down close to the sides."

This treatment is useful in specific fevers and adult imflammatory diseases. It has been most employed in scarlet fever, and should be used from the beginning and throughout its course. In moderate attacks it is sufficient to pack the patient for thirty to fifty minutes; but if the fever is very high, if the rash comes out slowly, imperfectly, and is of a dull colour, if the patient is restless and wanders, the packing must be continued an hour or longer, and be repeated three or four times a day. The development of the rash is thus promoted, the fever much reduced, the pulse quieted, the skin made moist and comfortable, and the restlessness and wandering much abated. A short time after the application of the wet sheet it commonly happens that a patient, previously restless and wandering, falls into a quiet refreshing sleep, and awakes calmed and free from delirium. Its influence on the pulse and temperature is striking ; the pulse in a few hours falling fifteen to twenty beats in the minute, and a repetition of the packing greatly reduces the fever. On suppression or recession of the rash, when serious symptoms arise, the packing is especially indicated. On applying the cold sheet the rash will generally appear of a brilliant and intense colour, followed by an immediate improvement of the patient's condition. After each packing it has been recommended to dash over the patient two or three pailfuls of cold water. During the whole course of the fever a cold wet compress, renewed every three hours, should be worn round the throat; and if, on the decline of the fever, the tonsils remain large, or there is chronic inflammation of the fauces or larynx, this application, renewed less frequently, or applied only at night, may be continued till these conditions are got rid of. The compress should be composed of linen several times folded. It should be fastened round the throat by a piece of dry linen of several folds. Cold packing has been beneficially employed in other fevers and in acute inflammations, as measles, small-pox, pneumonia, pleurisy, rheumatism, and gout.

In acute rheumatism, when, on account of pain, the patient cannot be moved, only the front of the body must be packed; and a wet cold compress, renewed every two or three hours, should be wrapped round each of the painful joints. If the prejudices of the patient's friends prevent the use of the cold sheet, the medical attendant should direct the body to be sponged with tepid or cold water several times a day, soap being employed if the perspiration is abundant and foul. In addition to the sponging, the wet cold compress, as previously described, should be applied to the painful joints. There can be no question of the superiority of this treatment over that of swathing the patient in flannel clothes, and covering him with blankets to make him sweat. To avoid the supposed danger of catching cold these woollen clothes are worn day after day, till, saturated with putrefying perspiration, the stench sickens and deappetizes the patient, and a crop of irritating miliary vesicles are engendered, which break the patient's sleep.

In pneumonia it is the practice with some to pack only the chest, and to renew the cold applications every hour, or even oftener. This treatment, it is said, removes pain in the chest, quiets the pulse, calms the breathing, and reduces the fever.

When, as commonly happens, the patient's friends object to the cold packing from fear of "inflammation," the sheet may be wrung out with tepid water, and by the time it is spread for the reception of the patient it will be sufficiently cooled to be of service.

It is an agreeable practice, preventing stiffness and aching of the muscles, if a pedestrian, immediately after great exertion, strips and wraps himself in a dripping wet cold sheet, well rubbing himself afterwards. If notwithstanding stiffness occurs, it may be removed by taking a few drops of tincture of arnica. Cold packing is useful in the summer diarrhœa of children.

ICE.

Ice is frequently applied to abstract heat, to check bleeding, to allay inflammation, and to destroy sensation. When used for any of these purposes, it is first broken with the help of a large needle into small fragments, and then inclosed in a bladder or thin india-rubber bag. The air should be squeezed out of the bag, which, after it has been one-third filled, should be tied at its mouth, on a cork, which affords a purchase for the twine. The ice bag may then be adapted to almost any shape, and fitted to the inequalities of the body, and, if required, may be fashioned into a sort of cap for the head.

This cap is often used to the head in tubercular and simple meningitis, and to allay the severe headache of the early stages of acute fevers. Sometimes the ice bag is laid on the epigastrium to ease the severe pain and vomiting of chronic ulcer, or of cancer of the stomach. It may be applied to the vulva when these parts are affected with prurigo; other treatment, however, is generally to be preferred.

A lump of ice sometimes is inserted into the uterus, or pushed into the rectum, to arrest uterine hæmorrhage after delivery.

Internally it is used for a variety of purposes. Sucking it allays the thirst, and so is very grateful to fever patients. It is used in the same way to check bleeding from the mouth or throat, stomach or lungs. To check bleeding from the stomach, small pieces should be swallowed.

Few means are so successful in combating acute inflammation of the tonsils or throat as the constant sucking of ice. Tonsillitis, the sore throat of scarlet fever, and other acute specific diseases, even diphtheria, may be much benefited by this treatment. It often proves most grateful, allaying the heat and pain, and checking the abundant secretion of mucus which is so annoying from the constant hawking and deglutition it occasions. In diphtheria the good effects of ice are most marked when its employment has been adopted at the very beginning of the complaint. This indeed is true of all inflammations of the throat.

When employed for the purposes just enumerated, the ice should be sucked as constantly as possible, and be continued till the disease has fairly declined. Ice is employed in the same way to allay the nausea, sickness, and pain of disease of the stomach.

Ice may be applied to an inflamed and prolapsed rectum or uterus, to reduce the inflammation and swelling, and so enable, these parts to be returned to their proper place.

Some apply ice to the head of persons with delirium tremens, and of children with convulsions.

After an operation for piles or fissure of the anus, pain may be dulled or removed by the application of a small bladder or india-rubber bag of ice.

Two parts of finely pounded ice with one part of common salt produce cold sufficient to freeze the tissues and deprive them of their sensibility. This mixture is largely used by Dr. Arnott. It is confined in a gauze bag, and placed in contact with the skin till its sensation is abolished and it has a leathery feel and a shrunken tallowy appearance. If applied too long, this mixture may vesicate; but this will not occur unless it is applied more than five or six minutes. This application is employed to prevent the pain of minor operations, as extraction of the toe nail, and opening the abscesses. Dr. Arnott recommends it in chronic rheumatism, erysipelas, lumbago, and to wounds. In chronic rheumatism it should be applied for six minutes to the diseased joints, to be then replaced for a short time by pounded ice, to prevent inflammation from a too rapid return of heat to the tissues. An attack of lumbago may be often cured by freezing the skin over the painful part. Dr. Arnott asserts that when applied to wounds it prevents inflammation without hindering union by first intention.

When applied for some hours, it destroys sensibility to such a degree that chloride of zinc paste may be applied in sufficient quantity to destroy the tissues for a considerable depth, without inducing pain or inflammation. The ether spray used in the manner introduced by Dr. Richardson is now generally preferred for the purpose of freezing the tissues, on account of its easy application and rapid operation.

By a single application of the ether spray we can often remove lumbago; * sometimes sciatica and those frontal headaches commonly called nervous, arising either from mental or bodily fatigue. Frontal headaches, too, dull and uniform in character, lasting many days, that not uncommonly occur from excitement or after an acute illness as erysipelas, a severe cold, or a sore throat, often succumb to ether spray; but it is generally requisite to freeze the skin of the forehead.

ON THE SPINAL ICE BAG AND THE SPINAL HOT WATER BAG.

THE profession is indebted to Dr. Chapman for the introduction of these applications, and for a rational explanation of their action.

Concerning the spinal ice bag, Dr. Chapman says, "I have

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* The pain and stiffness of the muscles of the back in lumbago may often be removed instantaneously by running a needle into the painful part for an inch or more: this almost painless operation should be performed on both sides of the loins when the lumbago is double. The passage of an interrupted current of electricity will generally speedily relieve lumbago.

proved by numerous experiments that cold applied to the back, not only exerts a sedative influence on the spinal cord, but also on those nervous centres which preside over the blood-vessels in all parts of the body. The *modus operandi* of this influence on those centres, and its effects, may be thus stated: 1st, It partially paralyzes them. 2nd, By means of the partial paralysis thus effected it lessens the nervous currents in the vaso-motor nerves emerging from the ganglia or nerve centres acted upon and stimulating the muscular fibres surrounding the arteries influenced. 3rd, By thus lessening those currents, it lessens the contractile energy of the muscular bands of the arteries to which those currents flow, and by doing so facilitates the dilatation of the arteries themselves. 4th, By thus inducing the condition of easy dilatability in the arteries acted upon, it enables the blood, which flows in the direction of least resistance, to enter them in greater volume and with greater force than before."

These effects are analogous to those obtained by Claude Bernard, who, on dividing the cervical sympathetic nerve, found that those parts supplied with this nerve, through the dilatation of the vessels, received an increased supply of blood, with a proportionate augmentation of their vital properties. Chapman says, "Those phenomena which Professor C. Bernard produced in the head of an animal by section of the cervical sympathetic, I have induced in the head, thorax, abdomen, pelvis, and four extremities of man, by the application of ice to the different parts of the back."

To supply an increased afflux of blood to any part of the body, Dr. Chapman applies the ice bag to various parts of the spine; to the neck and between the shoulders, when more blood is needed for the head; to the upper part of the back, for the chest and arms; to the lower part of the back, for the abdomen, pelvis, and legs. Dr. Chapman says:

I. "*Muscular tension is diminished by the application of ice along the spine.*" In support of this statement he asserts that the ice bag will prevent the cramps of diarrhœa and cholera, and is useful in laryngismus stridulus, chorea, tetanus, infantile convulsions and epilepsy, and "in prolonged muscular rigidity due to acute or chronic disorder of the nervous centres."

II. "*Sensibility is lessened by the application of cold along the spine.* This is proved conclusively by my experience, which has been considerable in the treatment of neuralgia."

III. "*Secretion is lessened by the application of cold along the spine.* I have assured myself by experience in numerous cases of the truth of this proposition. Morbidly excessive sweating, bronchorrhœa, the excessive action of the alimentary mucous membrane constituting the chief cause of diarrhœa, excessive action of the kidneys, leucorrhœa, and spermatorrhœa, I have restrained over and over again by cold properly applied to the appropriate part of the spine."

IV. "The peripheral circulation, and consequently bodily heat, is increased by ice applied along the spine." He narrates the following singular cases in confirmation of this proposition: "A woman, aged sixty, who for more than twenty years had always been cold to the touch, even over her shoulders and bosom, although she was warmly clothed; and her feet were habitually and extremely cold." After using ice during three weeks, several hours a day, the whole surface of the body, including her feet, became wonderfully warm. She was extremely astonished by the increase in the temperature of her body, as well as by the subsidence of every symptom from which she had suffered for so many years; and when she called upon me a week after the treatment had ceased, her newly acquired increase of general circulation, denoted by her increased warmth, still continued. Case 2 of this series affords a remarkable proof of the proposition in question: The patient, a man, aged fifty-six, who seemed nearer seventy, suffering from paralysis, epilepsy, and other grave troubles, complained that he was always "cold all over;" that he suffered especially from coldness of the feet, even in the hottest weather, and was obliged, as his wife said, "to sit near the fire in summer." Within one week after the treatment, which was continued three months, this patient had become warm all over—especially the feet. Within a month he said, "I feel as well as possible; but very hot, very hot." In this case, after the ice had been left off for some days, the patient became cold again."

Dr. Chapman asserts that ice applied along the lower dorsal and lumbar vertebræ, by increasing the amount of blood supplied to the pelvic organs, promotes menstruation, and can even restore the monthly flux when suppressed. By increasing the quantity of blood sent to the legs, the ice bag proves very useful to persons troubled with cold feet; a few minutes after the application of the ice, the author has often witnessed the feet become comfortably warm.

Dr. Chapman asserts that ice applied along the spine is extremely useful in cholera and tetanus, in sea-sickness, and the vomiting of pregnancy.

"The physiological conditions induced by heat applied to the back are precisely opposite to those induced by cold: 1st, The temperature of the sympathetic ganglia being raised, the flow of blood to them becomes more copious, and the functions consequently become more energetic than before. 2nd, Their nervous influence passes in fuller and more powerful streams along the nerves emerging from them, and ramifying over the bloodvessels which they control. 3rd, The muscular bands surrounding those vessels stimulated by this increased nervous afflux to contract with more than their usual force, diminish proportionably the diameter of the vessels themselves. 4th, The diameter of the vessels being thus lessened, the blood flows through them in less volume and with less rapidity than before: indeed, it is probable that, while the nervous ganglia in question are made to emit their maximum of energy, many of the terminal branches of the bloodvessels acted upon become completely closed." (Chapman.)

Dr. Chapman employs heat along the spine to contract the bloodvessels, and states that properly applied it will not only lessen but arrest the menstrual flow. As the result of his experience, he asserts that it will arrest menorrhagia and bleeding from the nose and lungs. In bleeding from the nose or lungs the hot spinal bag must be applied along the cervical and upper dorsal vertebræ; in menorrhagia, along the lower dorsal and lumbar vertebræ.

WARM AND HOT BATHS.

As might be expected, the effects of heat on the body are, for the most part, the opposite of cold. By surrounding the body with a temperature higher than its own, destruction of the tissues by oxidation is considerably lessened. It has been shown, moreover, by experiment that increased heat impedes or destroys the electric currents in the nerves, whence it may be fairly presumed they are the less able to conduct impressions either to or from the brain. These two circumstances may perhaps account for the enfeebling influence of heat on the body.

On the General Warm Bath.—This, if not too hot, is at first highly pleasurable, but throbbing at the heart and in the large vessels soon comes on, with much beating in the head, and a sense of oppression and anxiety. These sensations, however, are much lessened, or lost altogether, when perspiration breaks out. If the bath is continued, the foregoing sensations return, accompanied by great prostration, even to the extent of fainting. The pulse is greatly quickened and enfeebled, while the temperature of the body is very considerably raised, and may reach, if the heat of the bath be great, to even 104° Fah., that is, to a severe fever height.

Warm baths are employed in Bright's disease to increase the perspiration for the purpose of lessening the dropsy, and to carry off from the blood any deleterious matter retained in it by the inaction of the kidneys. But discretion must be used, for they greatly reduce the patient's strength, increasing the anæmia, and so may actually increase that general anasarca, to remove which the bath was employed.

Much of the dropsy of Bright's disease is due more to anæmia, than to the presence in the blood of poisonous excrementitious substances. As baths increase both the weakness and anæmia it is obvious that if injudiciously employed they will augment the general dropsy.

In the administration of baths in the cases now referred to it is hoped that urea, or products which if properly oxidized would form urea, may pass off by the skin, and so the system become freed of their poisonous effects. It is doubtful if warm baths can effect this elimination, as it appears to be almost certain that, in health, no nitrogenous substance finds its way from the blood through the skin. Still there can be little doubt that, under certain conditions, these baths do good, and often give great relief to the patient. If our object is to withdraw poisonous matters from the blood, it is time enough to act when there is reason to expect their existence; but when no noxious symptoms indicative of blood-poisoning, as headache and drowsiness, are present, baths are simply harmful.

The general warm bath may be employed with signal benefit for children affected with either simple or inflammatory fever. Used night and morning, for a time varying from five to ten minutes, the bath, if they are not very weak, soothes and quiets them, and is often followed by refreshing sleep. It is generally difficult to use the general warm bath with grown-up people suffering from acute febrile diseases; but in its stead sponging with hot water often induces perspiration, calming at the same time the restlessness of the patient, and favouring sleep. The restlessness of convalescence may likewise be soothed, and sleep promoted, by the same means.

The warm bath will mitigate or remove the pain of colic, renal, biliary, or otherwise. Whether its good effects are due to its soothing influence on the skin, or whether they result from weakness caused by the bath, it is difficult to say. The bath certainly seems to ease the pain before any noticeable weakness is produced. In skin diseases of various kinds the general warm bath is invaluable. In psoriasis, eczema, icthyosis, urticaria, lichen, prurigo, and scabies, it may generally be employed with benefit. It is especially useful in the acute stage of eczema and psoriasis. Rain or boiled water should be used; but if these are not available, the water must be made soothing by the addition of a small piece of common washing soda, gelatin, bran, or potato starch. These baths allay inflammation and itching. The body must be dabbed dry with soft towels; flannel should not be worn if there be much itching of the skin, and scratching should be prohibited. It has been recommended to keep persons suffering from severe burns immersed for days in the general warm bath. This treatment is said to ease pain, diminish suppuration, promote the healing process, and to lessen the contraction of the cicatrix.

The local warm bath is used for a variety of purposes. It is hardly necessary to refer to the common household practice of putting the feet into hot water just before going to bed, to promote general perspiration, and so relieve catarrh. Hot foot-bath or the sitz-bath is of great service to promote the menstrual flow when it is either deficient or absent. To this bath mustard may be added with advantage; but, as the late Dr. Graves insisted, it should be employed only at the menstrual period. This mustard bath employed every night, or night and morning, for six days, commencing one or two before the period begins, is a very useful auxiliary to other treatment, and often succeeds in establishing menstruation. Sometimes, from exposure to cold or from other circumstances, this flow is suddenly stopped, to the patient's great annoyance and suffering. Its return may often be effected by the use of the sitz-bath.

Dr. Druitt points out that the excessive perspiration of phthisis may be diminished for some hours by sponging the body with very hot water.

Hot water to the legs and feet often removes headache, and, according to Dr. Graves, relieves distressing palpitation of the heart.

It is asserted by Langenbeck, that, after an amputation, if the stump is kept immersed in a warm bath, it will avert pyæmia.

Sponging the face, temples, and neck with water as hot as can be borne will often relieve the headache of influenza, of catarrh, and of other diseases.

The *hot-air bath* is used to promote free perspiration, and often succeeds. If it is highly desirable to establish a free flow of perspiration, the hot-air bath may be preceded by the general warm bath.

Vapour baths are used for the same purpose. Less depressing than the general warm bath, they produce a much less elevation of the temperature of the body, which probably explains their difference in this respect.

PEROXIDE OF HYDROGEN.

Peroxide of Hydrogen has been used both internally and externally. Applied to either the skin or mucous membranes, it whitens them, and excites a pricking sensation, and, in delicate structures, as the conjunctiva, a slight amount of inflammation.

According to Dr. Stohr, when added to venous blood, pretty active effervescence occurs. The solution soon becomes yellowish red, then pale yellow, and in five or six minutes from the beginning of the experiment, colourless. Afterwards a white flocculent coagulum settles. The corpuscles themselves, when treated with a strong solution, become irregular in outline, and do not form rouleaus. Added to pus, much gas is given off, and the mixture becomes turbid with white flocculi. Many of the corpuscles are shrunken or altogether destroyed.

Applied to abraded surfaces, covered with blood or pus, the solution of peroxide behaves in the manner above described, the surface becoming ultimately covered with a thin layer of coagulated albumen. The solution, it is said, may be applied with decided advantage to chancrous sores, healing them in half the ordinary time. The sore is to be washed with the solution three times a day, and to be continuously covered with lint moistened with it. Open bubos have been successfully treated in the same manner. The solution is said to destroy the specific character of a chancrous sore.

Internally, it is reputed to be a disinfectant and slight stimulant.

CARBON. ANIMAL CHARCOAL.
" WOOD CHARCOAL.

Carbon, in porportion to its porosity, possesses the power to absorb many gases in considerable quantities, and as wood is more porous than animal charcoal, its absorbability is the greater.

All gases are not absorbed by charcoal in an equal degree; for it has little power in this respect over hydrogen, while it absorbs a considerable amount of oxygen, a large quantity of sulphuretted hydrogen, and a still greater quantity of ammonia. Charcoal is much used on account of this property as a disinfectant to remove bad smells, or to prevent the air in rooms becoming contaminated by the effluvia from foul ulcers. On account of its non-volatility it is very inferior to chlorinated lime or chlorine gas for purifying air, since it can act only on the air immediately in contact with it.

It is more effectual in absorbing the offensive gases given off by foul sores, and is generally employed in the form of a poultice, mixed either with bread or linseed-meal. Bread, being more porous is to be preferred, as it permits the gases to permeate the substance of the poultice, and so to come in contact with the particles of charcoal.

It may reasonably be doubted if, after becoming thoroughly moistened and its pores filled with water, the charcoal has not lost its power to absorb gases and so to act as a deodorizer. It is certain that charcoal poultices often fail to act in this manner. A far more efficient mode of employing charcoal is to fill a small flat muslin bag with it in a finely granulated form, and to place it over the poultice covering the sore. There is no doubt whatever of the efficacy of this method.

Charcoal poultices are reputed to possess the power of changing the condition of sloughing or gangrenous wounds, making them cleaner and more prone to heal. But it is very doubtful if charcoal possesses such a property.

How does charcoal destroy smells depending on noxious gases? It has been stated in a previous page that it is endowed with the property of condensing many gases in its pores, and many accept this property as a sufficient explanation of its action. Others assert that the oxygen condensed and accumulated in the pores of the charcoal, combining with the other gases with which it comes in contact, breaks them up and destroys their ill odour.

Of more practical importance is the question whether the carbon by use loses its property to condense gases or to destroy them, and so becomes inert. Buchheim states this to be the case, while others assert that if kept dry, charcoal retains its properties unimpaired for many years. Of these two statements the first is probably the correct one. When deprived of this property, it may recover it by exposure to a dull red heat.

Charcoal is likewise employed as a disinfectant, and it has been advised to use charcoal disinfecting respirators. These, no doubt, are of service against many gases, but at present no evidence exists to show that charcoal has the power to destroy the organic matters which propagate disease.

Charcoal, by its chemical or mechanical action, possesses the property of carrying down from solutions many colouring matters, many bitter substances, alkaloids, and mineral substances. Dr. Garrod has hence advised its administration in poisoning by corrosive sublimate, arsenic, morphia, strychnia, belladonna, etc. At present this treatment of poisoning has not found much favour with the profession. Charcoal also precipitates the colouring matter of urine, carrying down at the same time all the uric acid, and some of the urea in solution. The sugar of diabetic urine is unaffected by charcoal. As a precipitant of the above-named substances, animal charcoal freed from its earthy impurities is found to be the most efficacious, on account, it is said, of its more finely divided state.

On account of the angularity of its particles it is employed as a tooth-powder; but as charcoal is liable to decolorise the teeth, it is not much employed in this way.

In some diseases of the stomach charcoal is employed with with much success. It is said to ease the pain of chronic ulcer, and of neuralgia of the stomach. It is markedly useful in flatulence. In the majority, if not in all cases, intestinal flatulence is the result of gases generated by fermentation. The symptoms accompanying flatulence, however, are not always alike, and their various combinations afford indications for treatment. Sometimes "the wind" is produced in enormous quantities, with great rapidity, producing distention, eructation, and mental depression; the patient complaining only of these symptoms, not of pain nor of acidity. This enormous production of wind, irrespective of other symptoms, occurs most commonly in middle-aged women, especially at the change of life. Sometimes during pregnancy and suckling, and seldomer in the course of phthisis, this condition is met with. Great difficulty is often experienced in checking the formation of wind: vegetable charcoal is one of the best remedies for this purpose. Sometimes after a few mouthfuls of food the wind is formed in a quantity so large that the patient is constrained to cease eating: here the charcoal should be taken immediately before each meal. Other patients are not troubled with the wind till half an hour or longer after food: here the charcoal should be taken soon after the meal; five or ten grains of charcoal is generally enough. If this dose fail, it seldom happens that a larger one succeeds. Supposing charcoal to fail in cases like those described, we have another efficient resource in the sulpho-carbolates or carbolic acid.

At other times profuse formation of wind is accompanied by acidity. Charcoal, administered as above described, will generally obviate both these symptoms. Sulpho-carbolates and carbolic acid, although less successful than when acidity is absent, will often prevent the production of both wind and acidity.

Some persons after meals are troubled with a little wind, acidity, and a sensation of weight at the pit of the stomach. Charcoal will relieve these cases; but nux vomica, in five-minim doses of the tincture, taken a few minutes before meals, is to be preferred. In the treatment of flatulence it must never be forgotten to direct the patient, as far as possible, to abstain from those kinds of food prone to fermentation. Sugar and starchy foods must be avoided or sparingly eaten, and thin well-browned toast, on account of the carbonization of its surface, may be substituted for bread. The meals should be very moderate, the food well masticated, and drinking postponed till the meal is nearly finished, or still better, till an hour after its completion. Tea is very obnoxious to flatulent patients.

Most of the charcoal passes away with the fæces; a little, it is stated, finds its way into the blood and lymphatics.

For internal use, wood is preferred to animal charcoal. It is often advantageously mixed with equal quantities of bismuth, when flatulence is combined with acidity and pain.

CARBONIC ACID GAS.

It is asserted that this gas applied to the eye relieves the pain and photophobia of scrofulous ophthalmia, and that injected up the vagina it eases the pain of ulceration of the os uteri and of cancer and neuralgia of the uterus. According to Sir J. Simpson, the inhalation of this gas is of benefit in chronic bronchitis, asthma, and irritable cough.

It is generally employed dissolved in water. Natural waters containing a large quantity of carbonic acid are used externally in chronic gout, chronic rheumatism, and many chronic skin affections. Carbonic acid is an excitant of the skin, producing tingling, redness, and a feeling of warmth, increasing the flow of the perspiration, but after a time acting in some measure as an anæsthetic, lessening the sensibility of the skin, and removing or diminishing pain.

Carbonic acid water is employed in painful and irritable conditions of the stomach. It eases pain, and checks vomiting. It is an excellent plan to mix it with milk. The milk, often previously rejected, is then generally retained. If there is diarrhœa with irritability of the stomach, then lime water may profitably be substituted for carbonic acid water. If constipation is present, carbonic acid water is much to be preferred.

NITROUS OXIDE GAS.

Of late this gas has been extensively used as an anæsthetic. To Mr. Clover, the highest English authority on all matters pertaining to anæsthetics, the author is indebted for the following remarks :—

Preparation.—Nitrous oxide is made by boiling nitrate of ammonia in a glass retort. The gas and steam thus formed are passed through water to remove any of the higher oxides of nitrogen, and the gas collected in a gazometer.

Nitrous oxide is now prepared on a large scale, and condensed in iron bottles. Quite recently it has been sold in the liquid form by Mr. Coxeter. The contents of the bottle are easily measured by weighing. A gallon weighs about three-tenths of an ounce.

Effects on Animals.—Dogs and cats obliged to breathe the pure gas are killed in a few minutes; after making the usual efforts to get free they become insensible, make slight convulsive movements, and then breathe stertorously. The breathing always intermits before the heart's action fails. If the animal is brought into pure air when the intervals of breathing are not more than thirty seconds, it always recovers. The recovery is attended with panting respiration.

Administration.—In producing anæsthesia by nitrous oxide, it should be remembered that it is to be given pure, and without any admixture of air. The time required to fit the patient for the operation is to be reckoned, not from the commencement of inhalation, but rather from the time when the lungs are finally deprived of all atmospheric air, after which I believe that every patient is ready for the operation in a very few seconds. The gas may be conveyed by an inch tube either from the gas-holder or from an air-proof bag, holding not less than two cubic feet of gas. If the compressed or liquid gas be used, it must first be conducted from the iron vessel into an air-proof bag. Care must be taken not to allow the liquid gas to escape so rapidly as to produce cold enough to freeze the gas, and so for a time to stop the supply. The mouth-piece may be made so as to be held between the teeth; but this plan necessitates the pinching the patient's nostrils, and compressing his lips against the tube, which is objectionable. In spite of this a restless patient will sometimes draw in a little fresh air, which will keep him for the next half-minute either conscious or in such a state that he will struggle against the operation.

I find the apparatus which I have used for several years for giving 4 per cent. of the vapour of chloroform answer equally well for giving nitrous oxide. With the view of overcoming the liability of air to get accidentally under the mouth-piece during forced respiration, and for economising the quantity of gas used, I have added to the mouth-piece a supplemental bag, holding about two hundred cubic inches, connected to the mouth-piece by a three-quarter inch tube and stop-cock. A portion of the expired gas escapes through the expiring valve, and during inspiration the gas is supplied partly fresh from the larger bag, and partly from the supplemental bag. It answers the same purpose, and it is more convenient, to place a lever under the inspiring valve, so that the action of the latter can be stopped. Having applied the face-piece, the patient should be directed to inhale *freely* rather than rapidly, and to empty his chest at each expiration, so that he may get rid as speedily as possible of the residual air in his lungs. Pure gas is so free from taste and smell that it is very readily respired; he should be told that he will hear ringing sounds, and experience a sense of general pulsation, but that he has only to continue breathing freely to procure the wished-for sleep. After four or five respirations the stop-cock of the supplemental bag, which has hitherto been kept empty, should be opened to receive a portion of the expired gas, and again supply it at the next inspiration. If there is no supplemental bag, the lever just mentioned should be pressed upon. The apparatus of Mr. A. Coleman is for the purpose of purifying the expired gas from carbonic acid; it consists of a metallic vessel containing half a pound of slaked lime, and placed on a table near the patient. This vessel is connected on one side with the gas bag, and on the other, by means of a tube two feet in length, with the face-piece. It is not provided with any valve, so that the bag should be gently pressed during the first four respirations; and after this the expiring valve is fastened down, so that there may be no loss of gas. Afterwards I do not think it possesses any practical advantages. Lividity of the face is soon observed; this is not a sign of insensibilty, and may be disregarded; the eye soon becomes fixed, and if the conjunctiva is touched, the eyelids contract feebly or not at all; the pupil at this stage is of its normal size. Pinching the skin will now produce no signs of pain; a single tooth, not firmly fixed, may be removed, and such small operations as do not prevent the continuance of the inhalation may be commenced; but is necessary for enabling the operation to be continued for more that a few seconds without rousing the patient to a struggling condition, that other symptoms should be produced. Convulsive twitching of the hands and oscillations of the eyeball next occur, and at the same time, or soon after, the respirations become slower, and are accompanied with a snoring noise. If breathing should cease for fifteen seconds, the chest and abdomen should be pressed upon two or three times. The pulse should always be carefully watched during this part of the administration, lest syncope should occur, in which case the patient should be placed in a horizontal position, and be freely supplied with fresh air. The pulse remaining regular, and the pupil being only moderately dilated, the gas may be continued notwithstanding the convulsions mentioned, and although the breathing begin to be slow; but if the pupil dilate widely, or if the breathing intermit, the gas should be immediately withdrawn. It is astonishing to witness the degree of resuscitation afforded by a single full inspiration of air, so that if it is intended to keep up the anæsthesia, not more than one full inspiration of air should be allowed if the pulse continue distinct. Gas should be given for five or six respirations, and be again intermitted. In dental operations, on account of the mouth being open, the anæsthesia can be sustained for a limited time only. I have sometimes prolonged it by continuing to supply gas through the nostrils by means of a cap fitting closely over the nose, or by means of a tube held in the mouth; but in most cases the operator has time to extract several teeth before consciousness recurs, and it will generally be found to be the best plan to allow the patient, after one or more teeth have been removed, to awake sufficiently to be able to rinse the mouth, and then to give the gas again. A peice of wood should be placed between the jaws to keep them open, and it should have a string attached to prevent its slipping down the throat. An instrument like a small telescope, with a spiral spring inside, is better, as it will retain its position even if the patient try to talk. Most patients are glad to inhale again and again. Many persons find the sensation experienced very agreeable; some appear to suffer as from nightmare; it is very rare to have any complaint made of headache. Some persons suffering from headache have awaked from the sleep of nitrous oxide without any. It is doubtful if vomiting ever occurs from a single inhalation of nitrous oxide; but when blood has been swallowed, sickness of short duration has been produced. Such vomiting and prostration as we witness after chloroform and ether is unknown. As previously stated, there is nothing unpleasant in the smell or taste of this gas; indeed, it is hardly to be distinguished from common air, when absolutely pure; but some patients from timidity resist breathing, and so produce a sensation of tightness in the chest. Hysterical patients, when only half under the influence of the gas, are liable to have an attack, but it is of short duration, and most of such cases may safely be left to themselves. These subjects may present threatening symptoms when they cease breathing. In a case of this kind a patient is said to have ceased to breathe for two minutes. She had not taken enough gas to prevent her struggling against the dentist, and was either faint from the violent efforts she had made, or else was just conscious that the medical men were nervous about her, and was acted on by the desire of being an object of interest, so characteristic of some patients of this class. She had held her breath, or taken it so very softly as to seem not to breathe at all. The fact that the colour of the lips had improved, and that the pulse had rallied, and was going on with regularity, were signs that the nitrous oxide had nearly left the system. The laughing and gesticulation formerly witnessed in experiments with laughing gas is now seldom seen; and when it happens to occur, we can generally account for it by the patient not having inhaled gas sufficiently pure. Until quite recently it was given by means of a bladder and small tube, through which the patient breathed backward and forward; the gas would thus be diluted with some eighty cubic inches or more of residual air in the lungs, and a further dilution would be likely to occur through an involuntary or voluntary effort on the patient's part to obtain air.

Physiological Action.—It appears to produce its anæsthetic effects by preventing the oxidation of the nervous centres, and this chiefly by depriving the blood of its supply of free oxygen. Although there is more oxygen in nitrous oxide than in air, it is chemically combined with nitrogen, whereas air is a mixture of nitrogen with free oxygen. The effect of a moderate quantity of nitrous oxide, so long as the influence of the atmospheric air last inhaled remains, is exciting; but as soon as the oxygenating property of the blood is lost, the functions of the nervous system fail, and if fresh air be not quickly supplied, they cease, and the animal dies.

But although the inhalation of this gas deprives the blood of oxygen in an available form, it does not prevent the escape of carbonic acid; for if the expired gas is passed over lime water, or over hydrate of lime, as in Mr. Coleman's apparatus, the lime is found to have taken it up, and to be converted into carbonate of lime. A further confirmation of this is afforded in contrasting the effect of inhaling the same gas again and again from a bladder of small size. In this case the anæsthesia approaches slowly, is accompanied by excitement, and there is more or less headache complained of afterwards, which rarely or never occurs from breathing pure nitrous oxide.

The functions of the brain proper cease before those of the medulla oblongata, hence we have loss of consciousness before the respiration fails; and the functions of the medulla are abolished before those of the ganglia presiding over the heart, and hence failing respiration occurs before failure of the heart's action.

Only one death is known to have occurred within an hour of inhaling the gas. This case was one of extensive phthisis, and it has been supposed from this case, and from the lividity induced by the gas, that persons with delicate lungs are not fit subjects for taking it. If extensive disease of the lung exists, it would be imprudent to use it in the present state of our knowledge; but I have given it where I have believed only a moderate lung disease existed, and observed that in these cases no untoward symptoms were produced. Persons liable to syncope would seem to be unfit subjects, but many such patients must have taken the gas without serious consequences having occurred.

I have known no signs of mischief to the brain follow the inhalation. I have given it successfully to two persons who were the subjects of epilepsy.

Pregnancy is not a bar to its use; but in such cases it may be given with caution.

The danger of death from blood getting into the trachea would be as great or greater than when chloroform is given. The patient would unfortunately show no signs of it, as the lividity which *might* tell of it would, of course, not be distinguishable from that of nitrous oxide.

From all that I have seen of the administration of anæsthetics, and from the accounts published of the cases where they have been followed by a fatal result, it appears to me of little importance what is the age, temperament, or disease of the patient, in estimating the danger of using them. The young and old, feeble and strong, fat and thin subjects, have all on some few occasions died from them. On the other hand, we have witnessed the successful administration of chloroform, etc., in the advanced state of phthisis, heart disease, etc. The only reasonable hope of security lies in carefully preventing an overpowering dose, or the prolonged exhibition of a milder one, after symptoms of failing lungs or heart have shown themselves.

SULPHUR.

SULPHUR dusted on the skin produces no effect on it, but mixed with lard or other unctuous substances, and rubbed in, it produces a slight degree of inflammation, on which account sulphur ointment has been applied to indolent sores to excite them to a healthier and more healing condition. Other more efficient ointments for such a purpose have superseded sulphur ointment, which is now almost solely used as a remedy for itch. The object is to destroy the insect (*acarus scabiei*) and its ova, for it is on the presence of this animal that itch depends. From a knowledge of their habits we learn the means best calculated to destroy them. The female, as soon as impregnated, burrows obliquely under the skin, and day by day deposits her eggs till she dies. The male remains a wanderer on the surface, and can be easily attacked and killed by the ointment. To reach and destroy a female and her eggs, it is necessary to break up the burrows where these lie concealed, and to lay them bare to the action of the sulphur ointment. The destruction of the

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burrows can be easily effected by the liberal use of soap and water, by which the superficial and dead cuticle is removed, and the animal and its ova exposed.

Various methods of sulphur treatment are in use, but it is sufficient here to mention a few only.

M. Hardy claims that his method will cure in four hours. He orders the body to be first subjected for half an hour to a friction of soft soap; this cleanses the skin and lays bare the burrows. Then follows a warm bath of an hour's duration, during which the skin is well rubbed to complete the destruction of the burrows. After this the surface is well rubbed all over, except the head and face, unless in the rare instances when these parts are attacked, by an ointment composed of two parts of sulphur, one of carbonate of potash, and eight of lard. One such course effects a cure.

This rather severe treatment not unfrequently irritates, inflames, and chaps the skin. This method, therefore, is inapplicable for delicate skins, especially if much eczema or inflammation is present, which would undoubtedly be much aggravated by such vigorous treatment.

It is often sufficient to subject to this treatment only certain parts of the body, where the rash is most apparent, and to apply the ointment to other parts in a milder manner.

If the skin is delicate, much irritated, or inflamed, a mild soap may be substituted for soft soap, and an ointment without alkali and with less sulphur, while the time of the applications should be shortened, and several washings and inunctions, repeated on successive nights, should replace the one severe application. The ointment should be left on all night.

The simple ointment of the Pharmacopœia, containing no potash or other alkali, and little irritating to the skin, is in most instances sufficient. The patient should be directed to take a nightly warm bath, and to rub the skin with soap, bland or strong, according to the condition of the skin. After wiping the body thoroughly dry, the ointment is to be well applied to the skin before a fire, just before bed-time. The ointment must be washed off on the following morning. In three days the patient is usually cured.

The irritation set up by the parasite and its eggs excites sometimes more or less eczema and impetigo, when the foregoing treatment, although it would remove the itch, would certainly aggravate these accompanying eruptions. To avoid this complication Hebra recommends a milder ointment, of a different composition; namely, of chalk, 4 oz.; of sulphur and prepared tar, each 6 oz.; of common soap and lard, each a pound. In this preparation the various constituents serve each a distinct purpose. The chalk helps mechanically to remove the dead cuticle and to break up the burrows. The tar serves the twofold purpose of diluting the sulphur and acting beneficially on the eczema, while the soap and lard further effect the dilution of the sulphur, and the soap, by virtue of its alkali, checks the weeping from the red, raw, eczematous eruption. The application of this ointment, accompanied with the use of the warm bath, is employed twice in the day. In three days the cure is complete.

After the disease is cured, it often happens that even the mildest ointments excite and increase the eczema and other eruptions produced by the scabies. It is inadvisable therefore to continue for many days the use of such ointments, otherwise they may perpetuate these rashes. On withholding this treatment the rashes produced by the scabies will frequently disappear at once. After these applications the patient must have an entire change of linen, and the soiled clothes should either be boiled in water, or heated in an oven, at a temperature above 212° Fahr., to destroy the animals and their ova concealed in the texture of the linen.

It has been maintained by many that the sulphur of the ointment plays no part in the destruction of the animals and their eggs, but that the fatty matters, by obstructing their breathing-pores, suffocate, and so destroy them. This opinion appears to be erroneous, a sulphur ointment being far more effectual than a simple fatty one. Lice are destroyed by sulphuretted hydrogen, and some suppose that sulphur kills the itch insect by being converted into this gas.

Except in rare cases, the ointment need not be applied to the head and face, as in this country these parts are not often affected. The disagreeable smell of the ointment may be in part concealed by the addition of some otto of roses or other agreeable odorous substance.

On account of the disagreeable smell and irritating effect of sulphur, many dermatologists substitute storax for sulphur. Storax is said to be as effectual as sulphur.

The complexions of some young women, in whom the menstrual flow is disordered, are spoiled by numerous small elevations or pimples, scarcely or not at all reddened, the skin at the same time losing its healthy transparency. Sometimes on the summit of the elevation a minute pustule forms. This may be a form of acne, but is unlike that most commonly seen. Sometimes the eruption appears without disturbance of the menstrual functions, and at the menstrual period may almost disappear, to reappear when the discharge has ceased. This complaint may last months, or even years, greatly to the annoyance of the patient. This eruption will very generally yield to the application twice or three times daily of the following lotion:—Sulphur, a drachm; glycerine, an ounce; water, half a pint. This lotion speedily benefits the eruption when it has continued for years uninfluenced by other treatment. Acne may be treated in the same way.

An ointment composed of two drachms of hypochlorite of sulphur and an ounce of simple ointment is very useful in the various forms of acne. It should be well rubbed into the affected parts twice or thrice daily. This application, like others for acne, may be assisted by frequent washing with warm water and plenty of strong soap. In genuine prurigo, Dr. Anderson applies night and morning an ointment composed of an ounce of sulphur, six drachms of liquid tar, and four ounces of benzoated lard.

Being quite insoluble in any of the fluids of the mouth, it possesses no taste; but, as it often contains a small quantity of either sulphurous acid or of a sulphide, it may have the flavour of these substances. It undergoes no change in the stomach, and in no way affects the mucous membrane of this organ.

In the intestines, however, the case is otherwise. Here, in ordinary doses, sulphur causes rumblings, slight colicky pains, followed in a short time by a softened evacuation, which may be soon repeated. From the occurrence of colic, and the semi-solid condition of the motions, it is generally held that sulphur acts but slightly on the mucous membrane, but purges chiefly by its action on the muscular coat of the intestines, exciting these to contraction. From the mildness of its operation it is ranked among the laxatives. The precipitated sulphur, being more finely divided than the sublimed, acts as a purgative more surely and effectually.

If taken too long, it excites a catarrhal state of the mucous membrane, and impairs digestion.

Where a mild purgative is required, it is useful often to maintain the motions in a soft and yielding state, as in piles and fissure of the anus, that these parts may not be irritated and put to pain by hard unyielding stools. It is also employed in stricture of the rectum and in habitual constipation. It is supposed by many, among whom was reckoned Graves, of Dublin, that this remedy, apart from its power to soften the motions, has a beneficial action on the rectum in prolapsus and in piles.

What changes does sulphur undergo, and in what way does it act as a purgative?

Some of the sulphur, it has been thought, dissolved in the fat it meets with in the intestines, and becoming dissolved, is thus in a condition both to act as a purgative and to pass into the blood. This explanation is rendered improbable by the fact that when sulphur is administered, much fat being taken simultaneously, the quantity of sulphur in the urine is not increased.

The foregoing question receives its most satisfactory answer in the fact that some of the sulphur undoubtedly is converted into a sulphide by the action of the alkali of the bile. After the ingestion of sulphur the gas generated in the intestines contains much sulphuretted hydrogen, and much of it is given off by the skin, even to the extent of tarnishing any metal articles worn about the person.

By conversion into a sulphide, sulphur acts as a purgative, and by virtue of the same change it is enabled to enter the blood.

This view is supported by the fact that sulphides act in the same way as sulphur. Yet some probably passes through the walls of the intestines undissolved, and in form of fine particles, but the quantity so conveyed is undoubtedly very small.

The action of sulphur on the physical or chemical constitution of the blood is at present unknown. It is stated by some to have occasionally produced salivation in persons who had previously taken mercury. It is generally considered to excite in healthy persons an increased secretion from the mucous membrane of the air passage, although this is denied by Buchheim. By Graves, and other authorities, it is strongly recommended in doses of five to ten grains, repeated three or four times a day, in severe chronic bronchitis, with abundant discharge, especially when accompanied by constitutional debility. It is said to lessen the secretion, and to make its expulsion easier.

It has also been said to increase both the frequency and force of the heart's contractions, and to promote the flow of perspiration; but both these assertions greatly need confirmation.

It is asserted that the pain of chronic rheumatism and sciatica may often be relieved by applying sulphur to the skin over the seat of pain. As in applying the sulphur it is generally recommended to envelope the affected limbs in soft flannel, it is difficult to discriminate how much of the relief is attributable to the sulphur and how much to the flannel.

Chronic eruptions of the skin of the dartrous family, as acne, psoriasis, impetigo, and eczema, are said to be benefited by the internal administration of this remedy.

Most of the sulphur taken into the stomach escapes through the intestines with the fæces; while part of that which enters the blood, becoming oxidized, appears in the urine as a sulphate or one of the lower oxides of sulphur. The sulphuretted hydrogen, from its great volatility, escapes in some measure by the lungs and skin, and occasionally with the milk, and by the urine.

Some aver that a portion of the ingested sulphur passes through the system, and is separated by the kidneys in the uncombined state. This substance produces no change in the quantity of the constituents of the urine, with the exception of the sulphur compounds, which it augments.

SULPHIDE OF POTASSIUM.
„ SODIUM.
„ AMMONIUM.
„ CALCIUM.

MANY natural waters contain one or more of these substances. Sulphurous waters are found at Harrogate, Barèges, etc. They possess a disagreeable smell like rotten eggs.

The first three substances are freely soluble in water; the last scarcely so at all.

Strong solutions of these soluble salts excite active inflammation of the skin; weak solutions stimulate the skin, augment its supply of blood, and increase its perspiration.

Baths containing these substances prove very useful in the chronic forms of some skin diseases, as psoriasis, eczema, and lichen; likewise in chronic rheumatism, chronic gout, and chronic lead poisoning. The natural sulphurous waters are largely used as baths in these diseases. Care must be taken not to employ them till the acute stage of eczema and psoriasis has subsided, or the rash will be much aggravated. Obstinate forms of these skin diseases, rebellious to other treatment, often yield to these baths.

In explanation of the good results of sulphurous baths, in cases of chronic lead poisoning, it has been assumed that they eliminate the lead with the sweat. In support of this statement, it is said that, under the use of these baths, the skin becomes covered with innumerable black points of sulphide of lead. To this argument it may be objected that the lead thus blackened is deposited on the skin from without, not eliminated with the perspiration. But this objection is met by the assertion, that if a lead-poisoned patient carefully abstains from all contact with lead, his body still becomes blackened, time after time, as often as he may use a sulphurous bath.

As we shall see hereafter, when speaking of lead, it is difficult, on theoretical grounds, to understand how this metal can be eliminated with the perspiration; but for the further consideration of this point we must refer our readers to the section on lead.

Joints much distorted and stiffened by chronic rheumatoid arthritis may regain much of their suppleness by the use of these baths at a very high temperature. Yet as other baths of like temperature appear to do equal good, it is difficult to say whether the sulphides play any part in the good results.

A very efficient application for the itch is made in the following way :—Boil one part of quicklime with two of sublimed sulphur in ten parts of water, until the sulphur and lime combine. The solution should be allowed to stand, and then be decanted. Metal vessels should not be used in its preparation. The liquid solution is to be painted over the body after it has been well cleaned by a bath and wiped quite dry. This application is rather irritating, and sometimes produces roughness of the skin, which may continue some time after the application has been discontinued. This treatment was introduced by Dr. Bourguignon, who claims to cure the patient by it in half an hour.

These sulphides have a disagreeable taste of rotten eggs.

Taken into the stomach they are in part decomposed by the acids they encounter there, and disagreeable eructations of sulphuretted hydrogen gas are often given off.

In small doses the sulphides excite a sensation of warmth at the epigastrium, but in excessive doses they produce active inflammation in the digestive canal, with its customary symptoms.

Small doses act as slight irritants to the intestines, and determine slight relaxation of the bowels. It is supposed that sulphur acts as a purgative, by its conversion into a sulphide through the agency of the alkali of the bile.

These substances have been employed in cases of poisoning by many metallic salts. They precipitate the metal in the form of an insoluble sulphide, and so render it harmless. There is, however, danger of giving the sulphide in too large a quantity, when it would itself excite inflammation of the stomach ; wherefore sulphide of iron is often recommended as preferable in most instances to the alkaline sulphide.

Their effect on the blood after their absorption into that fluid is at present unknown.

Persons who habitually breathe air impregnated with sulphuretted hydrogen certainly suffer from great anæmia, and the gas appears to cause much depression of the functions of the body.

When taken by the stomach, they produce insensibility and speedy death. It has been doubted, however, whether this result be not due to the effect of these substances on the stomach itself, and not to their absorption into the blood and conveyance to the nervous centres; for it appears from Bernard's experiments, that sulphuretted hydrogen injected into a vein is so quickly eliminated by the lungs, that the arterial blood is uncontaminated by this gas, and consequently the nervous centres cannot be affected by it.

These substances may be very usefully employed in certain troublesome diseases, and often yield very striking results.

Thus, when taken by the stomach, they possess the power to promote suppuration. Their first effect on a sore is to increase its suppuration, and subsequently to dry it up and promote its healing.

It is noteworthy to observe how greatly these substances will modify boils and abscesses; in their very early stage they may be dispersed; but when matter has formed, they seem to check the surrounding inflammation, and so to limit their area. Moreover, whilst limiting the development of the boil or abscess, they exert a remarkable influence in hastening the maturation and the passage of pus to the surface. Their influence over abscesses and boils may be abundantly proved by any one who will give these salts a trial.

They considerably augment the suppuration and expulsion of the diseased products, and thus greatly reduce the deformities in the neck from scrofulous and tuberculous glands. Where the discharge from a sore is scanty, thin, and sanious, these medicines make it thick, creamy, healthly-looking, and at first abundant.

These salts are of great use in onychia.

Their good effects, however, are most conspicuous in scrofulous sores of the following kind, often seen in children. In scrofulous children, during the first few months of life, indolent abscesses, which run a very slow, inactive course, not uncommonly occur. They form in the cellular tissue. At first only a small hard substance is observed, no larger than a pea, under the skin, which is movable over it, and of its natural colour. These small substances gradually enlarge. The skin becomes adherent to them, and changes to red or even violet in colour; while often in their neighbourhood the smaller vessels become enlarged and even varicose. They may grow to the size of a florin, and, when maturated, feel soft and boggy. After a time a small circular opening appears, not larger perhaps than a pin's head, through which escapes a thin unhealthy pus. If deep seated, as on the buttocks, or in fat children, there may be no decoloration of the skin, or very little. The chief noticeable character, then, is the small sharply cut opening, as if a piece had been punched out. These formations follow one another; some are small, others of considerable size; and they may continue to distress the child for months or years. At the same time it often happens that the fingers, hands, and, it may be, the toes are affected. The fingers, especially about the joints, are much swollen, and become nodose. The skin over them is red, tense, and glazed at various places with rather sunken openings, through which a very unhealthy pus escapes. Large indolent abscesses may form on the back of the hand, containing a very watery matter. The bones of these parts are sometimes diseased.

This most troublesome affection is admirably treated with these medicines. Many of the abscesses, especially if in a very early stage of their development, dry up and disperse. Others are speedily brought forward, their contents discharged, and the ill-looking sore changed to a healthy and a healing condition. Their effects on the deformed fingers are very striking. At first the discharge is much increased, but is made at the same time creamy and healthy-looking. Then in a week or two the discharge grows very much less, the fingers reduce in size, and gradually assume their proper proportions, while the sores gradually heal. Whilst all this is in progress, the health of the child improves very greatly, although failing previously, perhaps, in spite of the administration of cod-liver oil and steel wine.

That the improvement is due to the sulphide is fully shown by the fact that it occurs when this is administered only. Indeed, in the author's experience, it is better at first to give this remedy by itself.

It will be noticed, moreover, that after the sulphide is commenced, new abscesses seldom appear, although the child may have been infested with them previously for many months, or even years.

Those very hard large swellings which sometimes form in the neck of children, behind the jaws, from an inflamed throat, as of scarlet fever and measles, may be effectively treated by this remedy. In these cases the abscess makes very slow progress, and causes the child much trouble and suffering. If matter has formed, these remedies will hasten its expulsion.

The following is the formula adopted by the author :—He orders a mixture of much the same strength as the Harrogate waters. Thus he directs a grain of the sulphide of calcium (the member of this group which he always employs) to be mixed with half a pint of water, and of this a child should take a teaspoonful every hour.

It must be carefully borne in mind that the salt rapidly becomes oxidized and changed into a sulphate, so that in a very short time none of the sulphide remains; consequently it is essential that the medicine should be compounded daily.

Sulphides of calcium may be administered as a powder, in doses for an adult of one-tenth to one half of a grain mixed with sugar of milk. A powder should be taken hourly or every second or third hour, as the case may require.

It will not be amiss to mention that, in employing these sulphides in baths, porcelain or wooden vessels must be used, as the sulphides attack and discolour most metals. These baths emit an offensive and powerful stench.

CHLORINE GAS.
CHLORINE WATER.
CHLORINATED SODA / CHLORINATED LIME and their Solutions.

THESE substances are used as deodorizers, disinfectants, and antiseptics.

Whatever power they possess in these respects is due either to chlorine or to hypochlorous acid.

They act probably in the following way:—Chlorine gas possessing very strong chemical affinities, seizes with avidity the hydrogen from many organic and inorganic substances, and thus breaks up their composition.

Hypochlorous acid, which is given off abundantly by the two last-mentioned members of the group, is an active oxidizing agent. It yields up its oxygen readily, and so destroys many substances: at the same time chlorine gas is set free, which again acts in the way just described.

These substances acting in this manner are deodorizers, destroying the ammonias, sulphuretted hydrogen, and sulphides of ammonia, on which the disagreeable smells of sick rooms depend.

Chlorine, from its gaseous state, is admirably suited as a deodorizer, as it penetrates every cranny of the room, searching out and destroying noxious and offensive gases.

It must always be borne in mind that, while these substances may be conveniently and profitably used as deodorizers, it is yet preferable to prevent bad smells by free ventilation, and that chlorine gas itself has an odour very disagreeable to most people. If these deodorizers are often required in a sick room, it is a sure sign that ventilation is defective, and probably that the nurse is careless.

These substances are employed as disinfectants, but the evidence in favour of their possessing such a property, although very generally held to be sufficient, is inconclusive.

When treated with these substances, some infecting matters, it is true, lose their power to propagate disease; but it is impossible to subject either persons or things, without destroying them, to such a powerful action as was found to be required in these experiments.

It is not however the less desirable to fumigate rooms lately occupied by sick people, as the process can do no harm, and may be highly salutary.

Besides destroying many offensive gases, these substances prevent decomposition; hence they are useful as washes or injections to prevent the decomposition of the pus of sores or in cavities of the body. Sloughing, foul-smelling sores should be washed with solutions of these or similarly acting substances. Chlorine compounds, being slightly stimulating, improve the condition of indolent sores. After an operation, it sometimes happens that hollows are left, in which pus collects and putrefies. The fetid gas and putrid pus becoming absorbed poison the system. This may be avoided by washing out the cavities several times daily with a weak solution of these substances. In puerperal peritonitis, or at any time when the uterus contains decomposing matters, it must be thoroughly and frequently washed out. It is desirable to add some deodorizing and antiseptic substance to the injected water.

In empyema, after the chest is opened spontaneously or artificially, the putrefaction of the contained pus must be prevented by washing out the cavity of the chest with antiseptic substances. In sloughing of the throat, as of scarlet fever or diphtheria, and in salivation and ulceration of the mouth, the smell and putrefaction must be removed by washing with similar solutions.

A strong solution of chlorinated soda applied to the throat in diphtheria has been highly recommended.

The deodorizing and antiseptic substances chiefly in use are members of this group, iodine, permanganate of potash, and carbolic acid. Solutions of permanganate of potash, unless unnecessarily strong, are bland and unirritating; while the chlorine and carbolic acid solutions are stimulating and even irritating. Carbolic acid in some respects is inferior to the members of this group. Both arrest or prevent putrefations, but carbolic acid manifests no power to destroy offensive gases.

IODINE.

Iodine possesses powerful chemical affinities, and combines energetically with many organic and inorganic substances. It is volatile, and penetrates readily the animal textures.

It is applied to the skin for a variety of purposes. A strong solution, as the liniment, is frequently used as a rubefacient and counter-irritant. At first it produces a sensation of heat and burning, which may increase to an unendurable extent. By the inflammation it excites, the cuticle becomes separated to a greater or less extent from the dermis. So slight may this be that mere desquamation results in a few days; but if the liniment is a strong one, even a blister, containing serum with much fibrin, is rapidly produced, leaving sometimes a permanent scar—a misadventure which it need hardly be said should be carefully avoided.

Two coats of the pharmacopœia liniment, lightly painted on the skin, can generally be borne, unless a previous application has rendered the skin thin and delicate, when one coat, lightly applied, is all that can be endured If, as sometimes happens, the application causes much pain, the iodine should be washed off with spirits of wine, gin, whisky, or eau de Cologne, and the pain subdued by the application of a poultice. Iodine liniment will often excite at and around the painted spot a crop of itching papules.

The liniment applied to the chest as a counter-irritant in chronic pleurisy is used to promote the absorption of the fluid accumulated in the pleura. It is painted, too, under the clavicles in the chronic forms of phthisis, to allay harassing cough, and to check secretion from the bronchial tubes and cavities of the lungs. It may also be painted on any part of the chest affected with pleurodynic pains, although a mustard poultice is preferable, as it can be reapplied, should the pain return. The iodine, however, may succeed where the mustard poultice fails. Iodine is painted around joints affected with chronic rheumatism or chronic gout, or with chronic synovitis. Like blisters, it eases the pain, and often removes the fluid distending the cavity of the joint; like blisters, too, it often causes, for a few days, increased distension of the joint, its good effects not becoming apparent till later. This increase in the swelling may be regarded as an indication of the success of the application. The liniment is useful when painted on the skin over a bronchocele. It should be applied as often as the state of the skin will permit, till the tumour disappears. It can seldom be borne oftener than once a week. The liniment or tincture is recommended as a local application to lupus. It must be painted, not only on the edges of the sore, but also over the tissues around. Thus applied, the spreading of the disease, it is said, is arrested. In the form of ointment its applications are various. It will be found of the greatest benefit in chilblains. The ointment should be well rubbed over the affected part before the skin is broken. The tincture lightly painted over the part is often used for chilblains, but the ointment is far more efficacious, curing the chilblains in one or two days, if the skin is unbroken.

The ointment is often useful in removing some of the non-inflammatory pains of the chest. These, however, not being always of the same nature, discrimination must be exercised in the employment of this ointment. When the pain is situated in the muscles (myalgia), and when these are tender on pressure, while the skin may be pinched without pain, this ointment is indicated. But if the tenderness is situated in the skin (pleurodynia), belladonna is to be preferred. The author believes Dr. Hare first pointed out this distinction, and it is one which holds true, but not without exceptions.

The ointment, tincture, and liniment of iodine are used for the same purposes; but it must always be recollected that the ointment and tincture are much milder preparations, and after several applications will produce but a small amount of desquamation. When a strong irritant action is needed, the liniment must be employed.

The tincture or the ointment is applied often to the skin, over indurated swollen glands, or over parts thickened by inflammation, with the intention of removing the diseased products. As an external application, iodine mixed with oil of tar in the proportion of two drachms of iodine to an ounce of tar, has been recommended by Mr. Coster, as an efficient application in tinea tonsurans. This application produces no pain, and without doubt prevents the extension of this troublesome disease.

As an irritant, the liniment, ointment, or tincture, will remove herpes circinnatus. One application of the liniment is enough, but the ointment or tincture must be applied once or twice daily.

The spreading of erysipelas, it is stated, may be arrested by painting the affected and circumjacent skin with a solution of iodine.

In hydrocele, iodine in solution is often injected into the serous cavity surrounding the testicle. The serous fluid is first drawn off, then a solution of iodine is injected into the cavity, which exciting in the parts over which it flows adhesive inflammation, the contiguous parts of the sac become united, and the further effusion of serum is rendered impossible.

Iodine solution is injected into joints affected with white swelling, into the cavity of the pleura in empyema, into ovarian tumours after tapping, and into large abscesses, after they have been evacuated. Ten ounces of the tincture, and even more, may be injected into an ovarian sac. The accounts of the cases thus treated are most satisfactory, and if the testimony of its advocates is not overdrawn, it is surprising that this treatment is not more widely employed. In the treatment of white swellings, it is said to produce no disagreeable symptoms; and unless there is caries or necrosis of the bones, or swelling of the surrounding parts, this treatment is generally favourable.

In chronic pleurisy, after the side has been evacuated, iodine injections remove the great fetor often present, arising from the decomposition of pus in the pleural sac, and at the same time diminishes the secretion from its walls. The injection must be at first weak, say four or five grains of iodine and iodide of potassium to a pint of water. When the structures have become accustomed to this injection, a stronger solution may be employed. Although no doubt such treatment is often successful, still it must be adopted with the greatest caution, otherwise inflammation, with high fever, may set in, and prove fatal to the patient.

Milder injections containing permanganate of potash, or a small quantity of creosote, are sometimes all that is required; and if these succeed in removing the fetor from the pus, the more powerful application need not be employed. Since the wasting, the loss of appetite, and depression in cases like these is mainly traceable to the absorption of poisonous gases and putrid fluids, it is of the highest importance to keep the sac free from foul gases and decomposing pus. The method lately employed by Mr. Berkeley Hill with much success may be adopted, supplemented or not by the employment of the injections just indicated. The fluid being drawn off from the cavity once or twice a day by means of a catheter, the chest walls soon sink in, and the lungs expand more or less till the pleuræ come in contact and unite, and so, by obliterating the pleural cavity, the further accumulation of matter is prevented.

Iodine solutions often prove very serviceable when injected into the cavities of large abscesses after their contents have been discharged. The tincture itself may be freely used; the cavity of the abscess should subsequently be kept clean and sweet by frequent washings with a weak solution of permanganate of potash. Iliac and lumbar abscess may be treated in this way. The tincture of iodine may often be used as an inhalation, with signal benefit, in the following instances:—

In the chronic forms of phthisis (fibroid lung), when the expectoration is abundant, and the cough troublesome, an inhalation used night and morning will generally lessen the expectoration, and allay the cough.

Children, six to ten years of age, after measles, or independently of it, on exposure to cold, are seized with hoarseness, a hoarse hollow cough, and some wheezing at the chest. The parts affected appear to be the larynx, trachea, and larger bronchial tubes. This affection often proves very obstinate, is apt to return, and continues a considerable time; but iodine inhalations will generally cure it.

Iodine inhalations have proved of great service in some epidemics of diphtheria. Dr. Waring-Curran recommends the following mixture:—4 grains of iodine, 4 grains of iodide of potassium, 4 drachms of alcohol, and 4 ounces of water. A teaspoonful of this should be added to boiling water, and the steam inhaled. The water should be kept hot by a spirit-lamp. As the patient becomes accustomed to the iodine, the quantity of the solution may be increased till half an ounce of it is employed at each inhalation. It should be repeated many times a day, and each inhalation must be continued from eight to twelve minutes.

There is still another affection of the respiratory passages which yields easily to these inhalations. Patients of various ages are greatly troubled, often for many years, with daily attacks, lasting, it may be, several hours, of sneezing, running at the nose of a watery fluid, weeping of the eyes, and severe frontal headache. This affection is often removed at once by iodine inhalations. The author adopts the following simple, handy, and clean plan of inhalation:—A jug, capable of holding about two pints of water, is well heated by rinsing with boiling water; then it is to be partially filled with boiling water, into which twenty or thirty drops of the tincture of iodine are poured; then the patient is directed to put his face over the mouth of the jug, and to breathe the iodized steam. To prevent the escape of the steam, both the jug and the head of the patient should be covered with a towel. This inhalation should be used night and morning, for five minutes, or a little longer. Too much iodine will occasionally produce a sensation of soreness in the chest and throat, sometimes with redness of the conjunctiva, running from the nose, and pain in the head.

The inhalation is sometimes employed in chronic bronchitis; but the author thinks without much advantage.

The tincture may be employed with benefit to remove tartar from the teeth, and to stimulate the gums when these are beginning to recede, leaving the teeth exposed to become decayed. It should be painted over the gums close to the teeth.

An iodine gargle, made with two or four drachms of the tincture, to eight ounces of water, has been recommended to allay mercurial salivation; and the tincture of iodine has been applied to sores of the throat, syphilitic and simple.

If taken into the stomach in undue quantity, iodine irritates and excites inflammation in the delicate structures of this part, inducing pain at the epigastrium, vomiting, diarrhœa, sometimes much collapse, and even death. It should be given soon after a meal, when the mucous membrane is protected by the food contained in the stomach.

When this substance reaches the stomach or intestines, and certainly when it enters the blood, theory would suggest that the iodine would become converted into either an iodide of potassium, or, more probably, of sodium, and that thenceforth, in its career through the body, it would manifest the effects of an iodide. Practically there is much to confirm this view, as the action of iodine is admitted very generally to be the same as that of the iodides on the distant organs of the body. Yet some practical authorities state that in chronic rheumatic arthritis the tincture of iodine is serviceable when iodide of potassium has failed. It is certainly difficult to understand how this should be.

Iodine may be used as a deodorizer and disinfectant in contagious diseases by simply suspending a chip-box or saucer containing a few grains over the patient's bed.

IODIDE OF POTASSIUM.

As this is an extremely soluble salt, and is endowed with a very high diffusion-power, it finds a ready entrance into the blood, and as speedy an exit from it with the secretions of the body.

As an external application it formerly enjoyed more favour than it at present holds. As an ointment it is often applied to the skin over enlarged glands, or parts thickened with inflammatory products, with the view of restoring the tissues to their natural state. The ointment of this salt, or of iodine, is often applied in bronchocele. It has a saltish taste.

According to most authorities, the iodide produces, probably after its absorption into the blood, decided changes in the mucous membrane of the mouth. It causes redness and injection of the lining of the cheek, the throat, soft palate, and of the tongue, and an increased growth and separation of the epithelium covering these parts, and an augmented flow of saliva. These phenomena however are certainly often absent after large doses of the medicine, and even in severe iodism.

A large dose proves an irritant to the stomach, and disorders digestion. Some are much more prone to be thus affected than others; and so marked is this difference that even minute medicinal doses sometimes irritate the stomach.

Like the chloride of sodium and chloride of ammonium, this salt increases the production of mucus from the stomach and intestines, as well as from the mucous membrane of other parts of the body. When such a result is desired, we resort to the chloride of ammonium in preference to this salt.

From its great diffusion-power it passes with great rapidity from the stomach into the blood, and very speedily appears in the urine. Only a small proportion, therefore, passes into the intestines, and it purges only when taken in very large doses; but it is never employed for this purpose.

When, either in the stomach or the blood, iodide of potassium comes in contact with chloride of sodium, it probably changes its base, becoming iodide of sodium.

At present we know but little what physical or chemical changes it produces in the blood; nor know we much regarding the organs to which it is carried.

If its administration is continued for a long period, or if the patient manifest great susceptibility to its action, we produce a condition termed iodism.

Many persons can take this drug in very large quantities for an almost indefinite time without the induction of iodism, while others suffer from it even after very small doses.

In iodism, the tissues most frequently and most severely influenced by this drug are the mucous covering of the eyes and lining of the nose, frontal sinus, and mouth, with the skin of the face. Some slight running at the nose is first noticed, with occasional sneezing, and a little frontal headache; these symptoms becoming more marked when the conjunctiva is injected, and the tears flow abundantly. The loose tissues about the orbit become swollen, reddened, and œdematous, and occasionally a peculiar rash appears on the skin of the face. This is at first noticed around the eyes, after which it attacks the nose and its neighbouring parts, and then the chin. The parts in the order here stated are most severely affected by it. The nose is sometimes reddened, especially at the tip, and is rather swollen. The rash has not always the same appearance. It is often very much like acne, and is always hard, shotty, and indurated, but the papules may be broad and large, and covered with what looks like a half-developed vesicle or pustule. The changes in the mouth have already been mentioned, when speaking of the influence of this medicine on that part.

With some persons the stomach is at the same time deranged, although in the author's experience this organ often escapes when the face is affected; on the other hand, some persons suffer in the stomach when they take this remedy, but whose nose and eyes are unaffected. When the stomach is singled out by the iodide, it induces nausea, and a sensation of sinking at the epigastrium, with loss of appetite, and sometimes watery diarrhœa. A grain or even less may thus affect the stomach.

If on the occurrence of iodism the use of the drug is discontinued, the symptoms just described very speedily disappear; and in the course of twenty-four to forty-eight hours the rash on the face, the running at the eyes, etc., will very greatly decline.

It sometimes produces distressing depression of mind and body. The patient becomes irritable, dejected, listless, and wretched. Exercise soon produces fatigue and perhaps fainting. The appetite is generally very bad. These symptoms may arise from a very small dose of the medicine, and may occur without coryza or irritation of the stomach. It is important to bear this in mind; otherwise, the cause of the depression being overlooked, the medicine may be persisted in. On discontinuing the medicine, these distressing symptoms disappear in one or two days. It now and then exceptionally happens that the symptoms just enumerated sometimes cease in a few days if the medicine is persevered in.

It is maintained by some that these symptoms of iodism can be prevented by giving with the iodide of potassium a full dose of carbonate of ammonia or spirits of ammonia. The author has many times put this recommendation to the test, but without any decided results, although it has appeared to him that the iodism was sometimes a little controlled by the ammonia.

The iodide is employed in a great variety of diseases. It is largely employed in syphilis, but is not equally efficacious in all its forms. It is most useful in secondary and tertiary syphilis, especially in the tertiary form, where mercury often does harm. When the health is broken, when mercury has been taken without good results, or when the bones are diseased, the iodide of potassium should be employed. Its action is conspicuously beneficial, especially when the disease fixes on the periosteum of the bones or fibrous structure of the softer organs, and forms what are called nodes. These speedily yield to this drug. It soon subdues the pain; and if not of long standing the nodes quickly disappear. Its action on this form of the disease is almost magical. Dr. Neligan prefers it to a salt of mercury in the treatment of tubercular syphilitic skin eruptions. It is of very great service when deep-seated and important organs are attacked by syphilis. It has been commended for its good influence on syphilitic irritis; but most authorities in this case prefer mercury. The secondary syphilis of children is best treated with mercury; yet the following somewhat new form of syphilis is better treated with iodine. There is sometimes observed in children a few months or years old a syphilitic thickening of the periosteum, usually attacking the heads of several of the long bones, but sometimes the shafts also. The thickening is first felt around the bones; but as the disease advances, the neighbouring soft tissues become infiltrated with a firm exudation, which may increase to such a degree that the part of the limb attacked becomes much swollen, the skin very tense and shining, and a little reddened. The affected parts are very painful. When the disease is seated at the head of the bones, the movement of the joint is not impaired. If it remains long uncured, this disease leaves permanent thickening and enlargement behind it; and so it sometimes happens that children with syphilitic teeth, and blind from syphilitic iritis, have the heads of several of the long bones considerably enlarged.

Other chronic periosteal thickenings, not of a syphilitic character, yield to this remedy.

The iodide of potassium has been recommended in mercurial salivation. The author agrees with those observers who believe that mercurial salivation is often aggravated by iodide of potassium; and yet it undoubtedly appears sometimes to do great good. As the action of the iodide on the mercury in the system throws much light on this question, we will now shortly discuss it.

The mercury salts, like those of most other metals, form with albuminous substances insoluble compounds. These compounds are very generally soluble in the chlorides, bromides, and iodides of the alkalies, but especially in the latter. Many of the metals, when conveyed into the blood, are deposited in an insoluble form in the animal structures, and amongst other metals, mercury and lead. Iodide of potassium, by re-dissolving these two metals, brings them again into the circulation, and so re-subjects the system to their influence. But iodide of potassium will promote the separation of both mercury and lead by the urine, and thus free the system from their pernicious effects. It has been said that iodide of potassium will dissolve mercury compounds of albumen in the body, and bring them back into the circulation; and herein we have the explanation of a well-known property of this salt, namely, that of producing salivation in persons who have taken previously considerable quantities of mercury. If a patient, after taking mercury for some time, had then become salivated, it would naturally be anticipated that iodide of potassium would still further increase the ptyalism, and not check it. In other cases it might happen otherwise; for we have seen that the salt will effect the separation of this metal through the urine. In a case, therefore, where but little mercury has been taken, and for a short time only, but in which salivation has occurred, the iodide of potassium, by quickly separating the metal from the system, would remove the mercurial symptoms, including the salivation. Should it ultimately prove that the increased elimination is due to the mercury being brought back into the circulation, and so under the influence of the kidneys, and that the iodide does not promote the exit of the metal in any other way, then the iodide must be simply harmful in mercurial salivation.

It has been said, in our foregoing remarks, that this salt of itself will produce salivation, an effect which has been ascribed to the action of the iodide on the mercury in the way just explained; others hold, even where no mercury has been taken, that the iodide of potassium increases the salivary secretion to a variable amount in different people.

From its efficacy in eliminating lead from the system through the urine, this drug is usefully employed in lead-poisoning. Indeed, in this respect it stands unequalled. Further on, when treating of lead, it will be shown how iodide of potassium, by virtue of its power of eliminating this metal, may prove useful in certain forms of gout.

It is of signal service in bronchocele, when the enlargement of the thyroid gland is due to hypertrophy, and not to cystic formations, or to other diseases. Under the influence of this drug, hypertrophic enlargement often speedily diminishes. Its internal employment is often supplemented by painting the tincture or the liniment of iodine over the swelling. Other indurations or enlargements of the glands, as of the mamma or testicle, are treated with iodide of potassium, though with less advantage than bronchocele.

The absorption of inflammatory effusion, such as occurs in pleurisy and in inflammatory thickening of organs, is effected more quickly when this salt is administered. Sciatica and lumbago are sometimes relieved by iodide of potassium; although both, and especially sciatica, not seldom remain unaffected by it.

Chronic rheumatism, chronic rheumatic arthritis, chronic gout, especially the two former affections, are sometimes benefited by iodide of potassium. It should, however, always be borne in mind, that the pains of secondary syphilis, frequently resembling in all respects those of so-called chronic rheumatism, are thus frequently confounded with and included among the manifold affections termed chronic rheumatism. Some of the so-called cases of rheumatism relieved by iodide of potassium are probably cases of syphilis.

The pains which iodide of potassium removes are almost always worse at night, so that this nocturnal increase of suffering may be accepted as a strong indication for the employment of this medicine,—an indication holding true, whether the pains are referrible to rheumatism or to some other complaint. Syphilitic pains, as is well known, are generally worse at night, and so are the pains of many cases of chronic rheumatism. It is in such cases of rheumatism that iodide of potassium is beneficial.

It is not uncommon to meet with persons, especially men, who suffer with a pain in the head, generally throbbing in character, sometimes accompanied with intolerance of light,—a pain which may be felt over the whole head, or, beginning at the back of the neck, passes over the vertex to the brow. This pain, worse, or, indeed, felt only at night, becomes then almost unendurable; and, in the patients' vernacular, is fit to drive them out of their mind. The pain is apt to be increased by alcohol. The pain having passed away, the scalp is left very tender. Whether this form of headache is due to syphilis it is impossible to say, as it does not present its characteristic features. Iodide of potassium in ten-grain doses, repeated three times a day, will generally remove these symptoms.

Barrenness has yielded to iodide of potassium. It is to be presumed that sterility thus cured was due to syphilis.

It has proved of signal service in some cases of chronic Bright's disease, even with considerable dropsy and very scanty urine. In these successful cases the urine considerably increased, the dropsy disappeared, while the general health simultaneously improved. Probably these patients owed their Bright's disease to syphilis.

It has been recommended in tubercular disease and in cancer, but experience has failed to endorse this treament.

Iodide of potassium is useful in both acute and chronic colds in the head.

Iodine has been detected in the blood, saliva, in the urine, and in the milk. It has been detected in the urine of the sucking child, whose mother was taking iodide of potassium. From its great diffusion-power it is probable that it might be detected in all the fluids bathing the tissues or moistening the cavities.

It appears in a few minutes in the urine, and even still earlier in the saliva. The rapidity of its absorption is, of course, influenced by the state of the stomach and vascular system, the absorption occurring more slowly when these are replete. The statements concerning its influence on the various constituents of the urine are so discrepant, and the observations made on the subject so very imperfect, that at present our knowledge in this respect must be considered as nil. When the administration of the medicine is discontinued, it is rapidly separated from the body, and soon, even after large doses, it is indetectible in the urine; nay, all trace of it may vanish in less than twenty-four hours after withholding the drug. It is stated that it may be detected in the saliva for some days after it has ceased to appear in the urine. This sounds doubtful.

Five grains three times a day is generally sufficient in most diseases. Sometimes, as in rheumatoid arthritis, and in cases of syphilis, no good is obtained until much larger quantities—as ten, fifteen, or even twenty, grains—are given at a dose.

Rapid sloughing of some syphilitic sores may be arrested, and healing promoted, by large doses of this medicine. Full doses not uncommonly succeed when smaller ones fail.

For the removal of syphilitic nodes from the membranes of the brain, five to ten grains, repeated three times a day, is generally sufficient. The pain, not uncommonly, is at first made worse by the remedy, then the disease rapidly declines. In no affection does this medicine work such striking results. Iodide of potassium may be conveniently administered in milk.

BROMIDE OF POTASSIUM.
„ SODIUM.
„ AMMONIUM.

In physical and chemical properties these salts are closely allied to the corresponding iodides; yet in their action on the body the bromides and iodides exhibit considerable differences.

As a local application to ease pain, or remove spasm, bromide of potassium, in five parts of glycerine, has proved useful, it is said, in hæmorrhoids, fissures of the rectum, and in painful growths.

Some observers state that when bromide of potassium is taken in moderate doses for some time, or when large quantities are administered for a shorter time, it induces loss of sensibility in the soft palate, uvula, and upper part of the pharynx, evidenced by the absence of movement in these parts when they are touched.

On account of this property the bromides are recommended to remove or lessen the excitability of the throat, preparatory to an examination of the larynx with the laryngoscope. It is even averred by some writers that merely brushing the pharynx and soft palate with a solution of the bromide is sufficient to quell the irritability of these parts so as to enable a laryngoscopic examination to be made with ease. Many observers, however, doubt the efficacy of bromide for this purpose. Dr. Mackenzie considers that ice is the only means of lowering the excitability of the pharynx.

Assuming that the bromides possess the property of diminishing the sensibility of the pharynx, it has been surmised that they may exert a similar influence on the larynx, lessening its excitability, and may thus prove useful in those diseases accompanied by spasmodic contraction of the glottis, as whooping-cough and laryngismus stridulus.

Such speculations, of course, are of little avail till put to the test of experience. After close scrutiny of the action of bromide of potassium on both whooping-cough and laryngismus stridulus, the author is convinced that it does control and remove them.

The discrepant statements concerning the influence of this remedy on these diseases can be reconciled in the following way :—

As to whooping-cough, all observers must admit that some cases are altogether uninfluenced by this remedy; that it neither lessens the frequency nor the severity of the paroxysms of coughing. In other cases it appears, however, to control both the frequency and severity.

The bromide, the author believes, will be found serviceable only in simple, uncomplicated whooping-cough. If there is fever or much catarrh of the lungs; if there is pneumonia, or tuberculosis; if the child is teething, and the gums are swollen, red, and painful; or if any gastric irritation exists, then this remedy fails till these affections have been met by appropriate treatment. When these complications are removed, the case being reduced to a simple form, the bromide of potassium does certainly possess power over the disease, lessening both the frequency and severity of the paroxysms.

It is thus found to be of most service in the summer, or when the weather is genial and mild. Like other remedies for whooping-cough, the bromides are more efficacious in some epidemics than in others.

As regards the action of bromide of potassium on laryngismus stridulus, its efficacy is subject to conditions very similar to those which limit its usefulness in whooping-cough. Any irritation, as from teething, must be removed before the remedy appears to possess any power.

As, however, we possess in cold sponging such an efficient, ready, and prompt cure for laryngismus stridulus, we need not have recourse to the bromide. (See Cold Bath.)

The salts of which we are treating are sometimes useful in whooping-cough and laryngismus stridulus when complicated with convulsions. It not unfrequently happens that, during a paroxysm of laryngismus stridulus or whooping-cough, the obstruction in the larynx becomes so great as to cause very imperfect oxidation of the blood, and so partial asphyxia, resulting in an attack of convulsions. The recurrence of these convulsions can be prevented by the bromides, even when they leave the disease apparently otherwise uninfluenced.

With regard to laryngismus stridulus, cold sponging is generally sufficient to avert the convulsions by preventing the spasm of the glottis on which they depend. But in those cases where, from the effects of any irritation, cold sponging is ineffectual, the convulsions in most instances will be averted by the bromide of potassium, thus obviating one of the gravest dangers of this disease.

It occasionally happens, from the time of their birth, that children without any malformation of the throat, can swallow solids with ease, yet are choked every time they try to drink. This affection is in no way connected with diphtheria or any visible affection of the throat. Children so affected may be much benefited by the bromide of potassium.

The bromides, so far as is at present known, appear to have very little influence on the stomach.

In certain diseases, these salts exert a beneficial influence on the intestines; for instance, in a form of colic, which sometimes affects children a few months to one or two years old. The walls of the belly are retracted and hard, while the intestines can be seen at one spot contracted into a hard lump, the size of a small orange, and this contraction can be traced through the walls of the belly travelling from one part of the intestines to another. These attacks of colic occur very often, and produce excruciating pain. This form of colic is unconnected with constipation, diarrhœa, or flatulence. Sometimes it is associated with a chronic aphthous condition of the mouth. It generally resists all other kinds of treatment, but will mostly yield at once to the bromides.

Like the iodides, these salts pass quickly into the blood, and we shall now treat of their influence on the organs to which they are conveyed by this fluid.

The bromide of potassium is used for a great variety of diseases, but in none are its virtues more conspicuous than in convulsions.

It is serviceable in all forms of convulsions, in epilepsy, in the convulsions of Bright's disease, and in the convulsions of children, whether due to centric or eccentric causes. Although convulsions may be excited by many causes, it is probable that the conditions of the nervous centres producing the attack are in every instance identical; and it appears to be these conditions which are controllable by the bromide. It is, however, necessary to speak separately of the influence of bromide of potassium on these convulsions.

In no disease is the bromide of potassium more efficacious than in epilepsy. But the bromide is not equally useful in all its forms, for attacks of *petit mal* are often unbenefited by the drug. It is the convulsive form of epilepsy which is so remarkably amenable to the bromide. In by far the greater number of cases, the fits, under its influence, become much less severe and less frequent. Even when of great severity, and repeated perhaps several times a day, the fits may be postponed for weeks, and even months; nay, in some cases, the fit has been delayed for years.

It has been asserted that chloride of potassium is as useful in epilepsy as bromide of potassium; this statement, however, has been denied.

Cases of the convulsive form, however, occasionally occur, over which the bromide appears to exert no influence; the fits recurring as often and as severely as when no medicine was taken. It is not possible at present to foretell when the medicine will succeed, and when it will fail. As might be expected, the effects of the drug are most marked when the disease is of short standing.

The remedy should be given in doses of ten to twenty grains, repeated three times a day. If the attack occurs only at night, the best way to avert it is to give a full dose of thirty grains at bed-time. It may be conveniently taken in beer.

If the patient is not cured, but only benefited, by the bromide, it may be continued for months or years. But its administration should be suspended at times for a few weeks, otherwise the system becomes accustomed to its presence, when it loses its power over the disease, so that it happens not uncommonly that the good effects, so well marked originally, cease altogether, the fits recurring with their old severity and frequency. If for a time the drug is withheld, and then resumed, all its former influence becomes again apparent.

Concerning the effect of the bromide of potassium on the convulsions sometimes accompanying whooping-cough and laryngismus stridulus, we have already spoken. In all other diseases accompanied by general convulsions, the bromide will often succeed. Of course the exciting cause of the convulsive attacks should, if possible, be removed; but where the cause is indetectible, this salt will often lessen or prevent the epileptiform attacks.

The convulsions caused by intestinal worms sometimes resist this remedy completely.

The convulsions resulting from simple meningitis, or which persist after the inflammation has declined, leaving serious damage behind, may often be checked by the bromide of potassium.

This salt has been much commended of late by Dr. Begbie as a soporific. It has been found of especial use in obviating that sleeplessness and wandering at night, not unfrequently occurring during convalescence from acute diseases. Often, too, it is of service for the like symptoms during even the febrile stage of inflammatory and specific fevers, as pneumonia, rheumatism, and typhoid fever.

In sleeplessness from other causes, as worry, overwork, grief, dyspepsia, etc., it may be employed with the expectation of success. If, besides sleeplessness, the patient, although of abstemious habits, suffers from delirium, having the characters of delirium tremens, these remedies are especially indicated.

The bromide of potassium is often of conspicuous benefit in delirium tremens, removing the delusions, calming the delirium, and inducing sleep. Its usefulness is most apparent in the earlier stages, before the delirium has become furious. It is, moreover, of great service in dispelling delusions that may remain after the partial subdual of the attack.

To produce sleep, fifteen to thirty grains should be given at night; and should this prove insufficient, the same dose may be also taken in the morning. In delirium tremens, twenty to thirty grains, or even more, may be given every two hours, till the patient falls asleep. The salt often succeeds as a soporific when opium fails.

Dr. Begbie recommends it for persons who have overtaxed their brain by study, or an over-strenuous application to business. It calms the excitement, procures sleep, and removes the giddiness, noises in the ears, and perversions of the external senses, which often harass these patients. In such cases it is invaluable. He also recommends this salt in acute mania.

Sometimes it happens that in the latter months of pregnancy a woman becomes the prey of the most frightful imaginings at night. She labours under the impression that she has committed, or is about to commit, some great crime or cruelty, such as murdering her children or husband. The bromide dispels these delusions, and induces calm, refreshing sleep.

Bromide of potassium is of great service in the treatment of night screaming of children, which appears to be allied to nightmare. Children from a few months to several years old may be attacked with this affection. Sometimes the attack occurs only once or twice a week, as is usually the case with older children, or it may be several times repeated each night. The screaming may last a few seconds only, or it may endure for several hours. These children, while screaming, are generally quite unconscious of what is occurring around them, and cannot recognize, nor be comforted by, their friends. They are generally horribly frightened. A somewhat similar condition is met with in children a few years old, a state very similar to somnambulism, but sometimes apparently allied to epilepsy. The child gets out of bed while fast asleep, walks about the house, and performs, quite unconsciously, various acts as if awake. This state is not accompanied with any terror. With the screaming and fright, squinting sometimes occurs, which, after some time, may become permanent. Bromide of potassium will prevent the screaming, and remove the squinting. This affection in children being very generally connected with deranged digestion, the condition of the stomach or intestines should be attended to; but even in spite of such derangement the bromide will give quiet and refreshing sleep.

The nightmare of adults will generally yield to the same medicine.

Men, but especially women, and usually townspeople, become subject to great despondency, at times so unendurable as to make them, as they express it, "feel as if they should go out of their mind." These distressing symptoms generally yield to bromide of potassium.

Dr. Begbie has used the same salt with great advantage in some cases of asthma, and also of diabetes. It occasionally relieves the pain of neuralgia.

It is also used with most decided benefit in certain derangements of the organs of generation. In some forms of menorrhagia it is equal, if not superior, to any remedy we possess. It is more useful in the flooding of young than of old women. Over that form of flooding due to uterine tumours of various kinds it exerts less control than ergot and some other remedies. To check profuse menstruation, its administration must be regulated by the circumstances of the case. If the loss of blood occurs only at the natural period, it will be sufficient to begin the medicine about a week before; and when the menstrual flux has ceased, the remedy should be discontinued till the next attack is about to begin. On the other hand, if the loss of blood occurs every two or three weeks, or oftener, the medicine must be given without intermission till the loss is controlled; and when the discharge has been brought to its right period and amount, it will still be desirable to give a few doses for a short time before each monthly period.

This remedy has been recommended by Dr. Begbie in nymphomania and puerperal mania. It is also employed to stay frequent seminal emissions. That the drug does possess this power, the author, from his own experience, has no doubt. Its employment should be supplemented by cold sponging of the scrotum and perinæum, and the suspension of the testicles in cold water for some minutes, night and morning. Seminal emissions are generally excited by dreams, which may generally be avoided by abstaining from suppers, and sleeping on a hard mattress. Dr. George Bird has pointed out that seminal emissions occur from undue indulgence in bed. They take place very generally early in the morning, during the second sleep. He recommends, therefore, that the patient should be roused after six or seven hours' sleep, and should never give in to a second sleep.

It proves useful in allaying various forms of hyperæsthesia, and sometimes eases the severe pain of chronic arthritis.

If the medicine is continued for a long time, as is sometimes required in the treatment of epilepsy, the physiological effects of the drug become apparent. "Diminished sensibility, followed by complete anæsthesia of the soft palate, uvula, and upper part of the pharynx, is the first symptom that the patient is getting under the influence of the drug. The sexual organs are amongst the first to be influenced, for there is soon produced failure of sexual vigour, and after a time marked diminution of the sexual appetite itself. Another frequent, if not constant, result of the prolonged administration of the bromide, is an eruption of small boils in successive crops, chiefly over the face and trunk, and accompanied with troublesome itching" (Bazire). Undue administration of the bromide renders a patient low-spirited, easily fatigued, and unfitted for work. On the suspension of the medicine all these symptoms soon subside.

SULPHURIC, HYDROCHLORIC, NITRIC, PHOSPHORIC, AND ACETIC ACIDS.

THE members of this group are powerful acids, and accordingly have a very strong affinity for alkalies and bases. Some of them, as sulphuric and phosphoric acids, absorb water with avidity. They all possess a high diffusion-power, and so pass readily through animal membranes and textures. These are the properties which explain most of their actions on the living body.

When concentrated, these acids produce decided changes in the skin by their affinity for the bases and water of the tissues, as well as in a minor degree for the organic substances themselves. Their great diffusion-power enables them to penetrate readily and deeply beneath the surface, and to continue their destructive action till they are diluted with water or neutralized by the bases of the animal structures. From their greater affinity for water, sulphuric and phosphoric acids are especially energetic; they withdraw this element from the textures, and thus effect their complete destruction. If applied in quantity, they will destroy the tissues to a considerable depth, and produce a brown or black eschar.

The remaining members of this group, owing to their feebler affinity for water, destroy the tissues less extensively, and their action is much more superficial.

Sulphuric and phosphoric acids are never used undiluted, on account of their physical action on the tissues. Nitric acid, on the other hand, is frequently employed to destroy and remove the surface of foul and unhealthy sloughs and ulcers; and, in virtue of a property of which we shall shortly speak, to change an unhealthy and unhealing sore for one more healthy and prone to heal. Thus it is frequently employed in cases of soft chancres, indolent and broken bubo, cancrum labialis, etc.

Nitric, hydrochloric, and especially acetic acid, may produce some vesication. Nitric acid colours the skin characteristically yellow.

They are often used for the purpose of exciting inflammation, and often with the best results. It is now established that two diseased actions cannot co-exist actively in the same part. On this principle, one or other of the three acids, nitric, hydrochloric, and acetic, are used. We apply an acid, usually acetic, to a patch of herpes circinnatus, thus cutting short at once a disease which tends to spread and to continue for a considerable time, and to establish in its place an inflammation which quickly subsides and disappears.

Thus it is that nitric acid induces a healthier action in indolent ulcers, or arrests the spreading of sloughing sores. Acetic acid, and somewhat diluted nitric acid, are frequently applied to warts, whose destruction they effect by withdrawing the bases, and by dissolving the tissues of the warts themselves. But although any of these acids are effectual, in many cases completely removing the warty growths, yet sometimes a fresh and abundant crop springs up in the neighbourhood of those undergoing treatment. Dr. George Bird finds the glacial acetic acid very effectual in removing warty growths.

Small syphilitic warts and condylomata are removed certainly and painlessly by keeping them constantly moist with a wash of diluted nitric acid. A drachm or two of the dilute acid to a pint of water is sufficient.

The members of this group are more generally employed, mixed with water, as external applications. Thus diluted, they still excite some irritation, and for this purpose may be used with very great benefit as lotions in urticaria, controlling the very troublesome itching, even preventing the formation of wheals, and in some cases appearing to be mainly instrumental in the removal of this disease.

As baths, acids, especially nitric and hydrochloric acids, are less employed now than formerly, yet, beyond all doubt, they exert a most powerful influence on the skin. A general bath, with two to eight ounces of the strong nitric or hydrochloric acid, is a most powerful exciter of a torpid skin.

What influence, if any, these baths bring to bear on the other organs of the body is at present quite unknown; no experiments have been made for the settlement of this question. It is highly probable, however, that these acids, in common with other materials dissolved in baths, remain unabsorbed by the skin, and that any change in the deep parts of the body resulting from their use must be ascribed to their direct action on the skin. Profuse sweating can in some cases be effectually controlled by sponging the surface of the body with water weakly acidulated by acids. The sweat is an acid secretion.

They act as stimulants to the skin, stripped of its cuticle;

thus nitric acid is frequently used as a lotion in the treatment of indolent and painful ulcers, for which it is a very valuable application.

Applied to the softer tissues, the dermis, mucous membranes, etc., they act as astringents, causing a direct condensation of the tissues, probably by removing part of the base, by combination with which the albuminous substances were held in the soluble form.

By virtue of their astringency they check profuse secretions from unhealthy sores. Nitric acid is mostly preferred in such cases. Nitric and acetic acids are often used as tests for albumen in solution. As we have stated, they precipitate the albumen by abstracting it from the base combined with it, and in setting it free convert the albumen into an insoluble substance.

These acids, when diluted, check very effectually bleeding from the smaller vessels and capillaries by constringing the tissues, exciting the muscular coat of the arteries to contract, and by coagulating the blood in the ends of the wounded vessels, and so plugging them. Thus vinegar, being always at hand, is valuable when diluted in checking bleeding from leech-bites, piles, cuts, etc.

Before we speak in detail of the action of acids on the various parts of the alimentary canal, it will save much repetition, and render our course much clearer, if we make a few general preliminary remarks on the action of acids on the secretion of the various glands opening into the alimentary canal.

It has been fully established by repeated and careful experiments, that dilute acids taken into the stomach check its secretion; while, on the other hand, alkalies stand prominent among the most powerful exciters of the secretion of the gastric juice. From these facts the more general law is inferred, that acids possess the power of checking the production of acid secretions from glands, while they increase the flow of alkaline secretions; the very reverse being the case with alkalies, which are supposed to check alkaline, but to increase acid secretions. This general law gains support by fully interpreting the effects, substantiated by experience, of acids on the secretions of the alimentary canal in disease.

Acids are powerful stimulants of salivary secretion. They act through the cerebro-spinal nerves, supplying the salivary glands; and if these are divided, acids lose their power of increasing salivary secretion. These acids produce the same effect on the mucous membrane of the mouth as on the skin, and for the most part are used for the same purposes.

Thus strong nitric acid is often applied to foul and sloughing ulcers, to change their character, and to check their progress.

Acids are in part neutralized by the alkaline secretion from the salivary glands, while any acid remaining free precipitates the mucus coating the mucous membrane, and, if in sufficient quantity, attacks the mucous membrane itself. If not too strong, they act beneficially as astringents, when the lining membrane of the mouth is relaxed or ulcerated, as in ulcerative stomatitis, salivation, etc.; but other astringents are to be preferred; for the acids are apt to dissolve the earthy constituents of the teeth. These remedies, therefore, should be taken through a quill, or a glass tube, or a reed.

But nitric acid exerts a further action on the mucous membrane of the mouth, and may be given in small medicinal doses with conspicuous benefit when in various ways this membrane is inflamed or diseased, as in ulcerative stomatitis, aphthæ, salivation from mercury, or when reddened, inflamed, and glazed, a condition not unfrequently met with in great irritation of the digestive organs.

These, with other acids, such as citric, tartaric, etc., quell the thirst of fever patients much more effectually than plain water, especially if the drink is made rather bitter with some agreeable-tasting substance, as orange-peel or cascarilla. Much of the troublesome thirst of fevers is not the expression of the wants of the general system, but is owing to dryness of the mouth and throat. This disagreeable local sensation is very liable to lead fever patients to drink more water than is really good for them, producing loss of appetite, indigestion, and even diarrhœa and flatulence.

The action of acids in lessening this thirst has already been explained. Acids, as we have seen, probably increase alkaline secretions, and thus the acid drinks used by fever patients promote, in the salivary glands, an increased secretion. Bitters, as we shall subsequently see, possess the same power, and hence it is that acid and bitter drinks, by their action on the salivary glands, keep the mouth and throat comfortably moist, and so remove the distressing feeling of thirst. By lessening the troublesome thirst they quiet the patient, quell irritability of temper, and so favour sleep. Under this soothing influence the pulse grows quieter, and the heat of the body diminishes; hence these medicines, especially the organic acids, are largely employed as fever medicines. They are applied to the throat for the same purpose as to the mouth. Thus, as a topical application, undiluted nitric acid acts beneficially on the foul sloughs or ulcers occurring in the course of scarlet fever or other diseases.

Bretonneau has strongly recommended the application of strong hydrochloric acid to the throat in diphtheria. The acid may be used undiluted, or it may be mixed with an equal part of honey, which gives the mixture consistence, and makes it cling for some time about the parts on which it is painted. It should be applied to those spots only of the mucous membrane attacked by the diphtheritic inflammation, not to the neighbouring healthy tissues, where it would produce active inflammation. The diphtheritic membrane being very liable to implant itself on inflamed surfaces, the application to the sound tissues may favour the spread of the disease. This treatment, however, is of little, if any, service, and in the author's experience utterly fails to check the progress of the inflammation.

Nitric acid, in small medicinal doses, may be given with benefit when the throat presents the same appearances as those of the mouth previously described [*vide* p. 85].

The albuminous constituents of food are digested and rendered soluble mainly by the agency of acids. But for this purpose all acids are not equally efficient. Lactic and hydrochloric acids far outstrip all others in this respect, while sulphuric acid hinders rather than promotes digestion, by precipitating the albumens in an insoluble form. The action of acids on nitrogenous substances is greatly heightened by the addition of pepsin.

Thus dilute hydrochloric acid may be employed to assist digestion where the secretion of gastric juice is scanty. After the considerations developed at the beginning of this section concerning the action of acids on acid secretions, it is obvious that the time of its administration, in respect to the meals, is all-important. If given before the meal, acids check the secretion of the acid gastric juice, and so hinder, instead of aid, digestion. Where there is scanty secretion, the acid must be given after the meal, when the secretion from the membrane of the stomach is completed; then the additional acid will assist the action of that secreted naturally, but too scantily. In many cases of atonic dyspepsia, alkalies are preferable to acids; but they must, of course, be given a short time before a meal, because they then stimulate abundantly the secretion of the gastric juice. In most cases of atonic dyspepsia, alkalies, with the precautions noted, are superior to acids given after the meal, although, as is well known, certain cases occur wherein acids answer better than alkalies. Such cases are presumably those where the mucous membrane is considerably damaged and spoiled by excesses in eating or drinking, and where, owing to degeneration of the glands of the stomach, no stimulant can excite a sufficient flow of gastric juice.

Acids, as we have seen, possess the power to check or lessen the secretion of gastric juice. In many diseases of the stomach, or from sympathy with other distant organs, the follicles pour an excess of acid into the stomach. The administration of acids shortly before food is taken checks this undue secretion. But acidity of the stomach is often owing to excessive or irregular fermentation, which leads to the production of a large quantity of various acids, as acetic, butyric, and lactic. This excessive or irregular formation is checked by acids; and as undue secretion of the gastric juice, or excessive formation of acids by fermentation, are the two causes of acidity, so in acids we have remedies able to control and check the acidity of the stomach, and with it the very distressing symptoms accompanying this condition, whether due to pregnancy,* uterine disease, calculus of the kidneys, the various dyspepsias, or more serious diseases of the stomach.

* The acidity of pregnancy is often prevented by two or three drops of tincture of nux vomica, taken a few minutes before meals. It is sometimes controlled by ipecacuanha.

This conclusion is abundantly proved, as practical men well know that the administration of acids checks acidity, removing the acid eructations, the heartburn, and the sense of discomfort at the chest and epigastrium, arising from excess of acid in the stomach. Hydrochloric or nitric acid is generally preferred, and a small medicinal dose, separately or combined, is ordinarily sufficient, provided the prescribed conditions are complied with.

Patients are sometimes greatly annoyed by eructations of an offensive gas, with the odour and flavour of rotten eggs. It evidently consists largely of sulphuretted hydrogen gas. Dr. Day, of St. Andrew's, has noticed that in such cases the urine is loaded with oxalic acid, for which condition he strongly recommends the employment of the mineral acids. Nitric acid is likewise of great use in the treatment of dyspeptics with oxalic acid in the urine, but free from eructations of sulphuretted hydrogen, and who suffer from great mental depression.

In the treatment of dyspepsias, a clue to the administration of acids on the one hand, or of alkalies on the other, is sometimes to be obtained by testing the reaction of the fluids ejected from the stomach. Not unfrequently, soon after a meal, a fluid regurgitates almost unconsciously into the mouth. Sometimes this is strongly acid, setting the patient's teeth on edge. This acidity and pyrosis is almost immediately removed by the exhibition of nitric or hydrochloric acid shortly before each meal. On other occasions the fluid of pyrosis has an alkaline reaction, often accompanied by much distress, with nausea and vomiting of the just-eaten food; the rejected contents of the stomach generally show a strong alkaline reaction. Here all the distressing symptoms, the nausea and the vomiting, may be removed by the use of an acid immediately after a meal. On theoretical grounds, we should expect an alkali administered shortly before the food is taken to yield even more satisfactory results. But the author has had no experience of the use of alkalies in such cases.

It need hardly be said that acids given soon after a meal to patients troubled with acidity and heartburn, greatly aggravate their sufferings. It is adding fuel to fire. These remedies should not be continued too long, lest they should not merely check undue acidity of the stomach, but exceed this office, and by lessening the secretion of gastric juice to an undue extent, actually induce the very opposite condition to that for which they were, in the first instance, employed. To those who have watched the action of acids on the stomach, it is well known that if too long continued, the improvement which first follows their use, lessens, ceases, then fresh symptoms arise, which, with apparent strangeness, are relieved by the very opposite treatment which had previously benefited.

If their administration is long continued, they excite a catarrhal inflammation of the mucous coat of the stomach and intestines, accompanied often by diarrhœa, and even general wasting. This action of acids explains the occasional effects of vinegar, when taken for a long time, in reducing the stoutness of fat people. For this purpose vinegar is sometimes taken surreptitiously in wine-glassfuls several times a day. It may reduce the stoutness, but it does so at the expense of serious damage to the body, and is a practice which cannot be too strongly condemned.

Acids, it has been ascertained, possess no power to check the growth of sarcinæ in the stomach. They even often fail to check the acidity accompanying these growths. It is a common practice among soldiers, when drunk, to drink a wine-glassful of vinegar in a tumbler of water, with the view to remove the intoxication. Whether it does sober them is not quite certain, but that it steadies them, and gives more precision to their movements, is no doubt correct, enabling drunken soldiers to pass muster when they present themselves at barracks.

By their astringent action, and from their power of coagulating the blood, they are useful in bleeding from the stomach. Sulphuric acid is generally preferred to the other members of this group. Many other astringents are surer.

From their high diffusion-power, these acids pass readily from the stomach into the blood. Those acids which pass into the intestines must, to a great extent, become neutralized by the alkalies of the bile and pancreatic juice, and as acids can affect to a very small extent, by direct contact, the middle and lower part of the intestinal tract. But in becoming neutralized, some of the biliary and weaker acids are set free, heightening in some degree the acidity of the contents of the intestines.

Dilute acids are used as antidotes in poisoning by the alkalies.

What influence the acids exert on the pancreas or liver is unknown. As the secretions from these two glands are alkaline, it has been suggested that the acids may increase their secretion; but on this point nothing is known with certainty. It has been long held that nitric acid acts in some way beneficially on long-standing diseases of the liver, as in chronic congestion and cirrhosis, and that this drug will augment the flow of bile after the liver has struck work from the excessive use of mercury.

Sulphuric acid is highly useful in checking summer and choleraic diarrhœa. Of this there can be no doubt, although, as it is generally administered with opium and warm carminatives, it is difficult to distribute to each remedy its exact share of merit. Its mode of action is less obvious than its efficacy. It may control the formation of acid in the intestines, or, as has been supposed, it may act as an astringent, and so check diarrhœa. If as an astringent, then, as the acid is soon neutralized and converted into a sulphate in the upper part of the small intestines, losing its astringency at once, its influence on the lower and middle part of the small intestine must be exerted through the nervous system, by means of the nervous sympathy existing between one part of this canal and another. Sulphuric acid is considered to be often capricious, giving rise to much uncertainty in its administration. This lack of uniformity in its results can be accounted for, in many instances, by the dose. Good effects certainly follow a small medicinal dose, whilst a full one, by increasing the acidity of the canal, may even aggravate the diarrhœa. Dr. Neligan and other authorities recommend it in chronic diarrhœa, and to control the "profuse sweating and colliquative diarrhœa of hectic."

In small medicinal doses, nitric acid is of great use in many diarrhœas. Thus it often acts admirably in the straining diarrhœa of children, when the motions are green, curded, and mixed with mucus. Motions of this sort are often very sour smelling. This form of diarrhœa is speedily checked by the exhibition of acids, which obviate the acidity of the intestinal canal, on which this flux depends. On the whole, other remedies are to be preferred to acids. Nitric acid may sometimes be used with great benefit, especially when given with pepsin, in that chronic diarrhœa of children when the motions smell sour, very disagreeable, and are pale and pasty.

Internal piles are successfully treated by the application of strong nitric acid to the enlarged and dilated vessel; two, or at most three, applications are sufficient; nor need the acid be applied to the whole surface, but its application to one or two points is sufficient. A superficial slough follows. It produces little or no pain. It is useful in granular or ulcerated piles. After the slough separates, the contraction of the sore diminishes the swelling. A drachm or half a drachm of the dilute nitric acid to half a pint of water is an excellent lotion for bleeding piles. It stays the hæmorrhage, constringes the swollen and inflamed tumour, and eases the heavy, tensive, wearying pain.

Acids are reputed to heighten the action of purgative medicines, and sulphuric acid is sometimes employed for this purpose. They are usually added to purgative salts, as Epsom salts, when a tonic and bracing action on the mucous membrane is desired, as in many cases of anæmia of young women.

If not already neutralized on their passage into the blood, these acids must at once become so, and it would appear that thenceforth their history must be that of the salts they form. Yet the reputed action of these acids on the organs of the body is so different from that of any of their salts, that the behaviour of the acids must be spoken of separately from their salts.

On combining with the alkalies of the blood, they must set free some weaker acids, and so to a slight extent lessen the alkalinity of that fluid, as is evidenced by the increased acid reaction of the urine which follows the use of these mineral acids. What further effects they may have on the blood is at present quite unknown. They are reputed to be tonic and bracing, but the improvement in the general health may be more safely attributed to their action in the intestinal canal. Still, they do produce certain changes in the fluids and solids of the body, since acids, especially vinegar, are beneficial as preventives of scurvy, when lime-juice or fresh vegetables are not to be obtained.

Dr. Rees recommends lime-juice in acute rheumatism, in large doses—as eight ounces daily. Dr. Inman speaks highly of this treatment. He finds that tartaric and citric acids cannot be substituted for lime-juice, and that lemon-juice is inferior to it.

Nitric acid is recommended in secondary syphilis. Salivation, it is said, has been caused by its administration; if so, salivation may have been due to the direct action of the acid on the mucous membrane increasing the alkaline secretion of the salivary glands.

Acids in fevers, we sometimes observe, abate the rapidity of the pulse. This result is probably not due to the direct action of the acid on the heart or nervous centres, but with more likelihood is ascribable to the diminished restlessness, through allaying the troublesome thirst.

Sulphuric acid, especially in conjunction with sulphate of zinc, is considered by some to check the profuse sweating of phthisis and other exhausting diseases; and by Dr. Graves a similar action was ascribed to vinegar. The following was his favourite recipe: Distilled vinegar, ℥ij. Laurel-water, ʒij. Syrup, ʒvj. Aqua, ℥v. Of this he gave an ounce or two ounces every third or fourth hour. Further, sulphuric acid appears to possess a decided power of checking bleeding from the lungs or womb. It is difficult, indeed, to understand how an ordinary dose of sulphuric acid can exercise such an influence after becoming so greatly diluted by admixture with the blood, and the difficulty is further increased when it is borne in mind that these acids, either before or immediately after their entrance into the blood, are converted into salts, as sulphates, nitrates, and phosphates. Whatever influence, therefore, is exerted on distant organs must be effected through these combinations; yet we cannot ascribe to any salts of these acids properties similar to those ascribed to the acids themselves.

In questions like these, experience is a safer guide than speculation. For the subtle influence of even small doses on distant organs of the body, is well exemplified by the influence of these medicines on the mother's milk; for if she has taken acids for some time, they induce sickness, diarrhœa, and colicky pains in the child.

Phosphoric acid has been recommended in diabetes. Greisinger, who has carefully studied the action of this medicine, considers that it does more harm than good. He pushed the dose to the extent of an ounce of the acid daily, and found this dose increase the sugar. The members of this group augment the acidity of the urine, whence it has been proposed to dissolve phosphatic calculi by thus rendering the urine more acid. The objections to this method of treating calculi are great, since the action of acids on the mucous membrane of the stomach and intestines precludes their persistent administration; whilst, to effect any notable change in the size of a stone, they must be taken for a considerable time, as the acidity of the urine is but slightly heightened by their adminstration.

The injection of nitric acid, sufficiently diluted, has been employed with success by some eminent surgeons, and is a far more effectual treatment for phosphatic calculi. From his experiments on the solvent power of dilute solutions of this acid on calculi after their removal from the body, Dr. Roberts of Manchester considers this treatment worthy of much wider application than at present obtains. By neutralizing the urine, if alkaline, and preventing its decomposition, such injections protect the mucous membrane of the bladder from the irritation of the alkaline urine.

The further influence of sulphuric, nitric, and hydrochloric acids on the urine is unknown. Of the influence of acetic and phosphoric acids we shall speak in another place.

Before closing our remarks on the action of acids on the body, it is right to say that phosphoric acid may possess many other properties than those specified above; but these will be referred to when we speak of the phosphates, in which form this acid exists in the blood, and manifests many of its good effects on the diseased body.

SULPHUROUS ACID.
SULPHITES.
HYPOSULPHITES.

Sulphurous acid is commonly used as a deodorizer and disinfectant. It is a deodorizer by virtue of its power to arrest putrefaction; hence it may be used to prevent bad smells, but it possesses little or no power to decompose offensive gases; consequently it is of little service in destroying foul odours. By destroying the minute organisms that determine fermentation, it arrests this process. It is ranked among disinfectants, but at present there is no proof of its power in this respect. Many suppose that contagious diseases are produced by minute organized particles. Sulphurous acid, it is said, will destroy these. If these conjectures are correct, sulphurous acid is a disinfectant.

The acid is of great use in chloasma, by destroying the parasite on which the disease depends. The acid of the pharmacopœia, mixed with an equal quantity of glycerine, may be used (Garrod). Warm baths should also be employed to remove the cuticle infested by the parasite. It is useful also in favus, and in tinea tonsurans. When these diseases are unusually obstinate, its action should be assisted by epilation.

In this section a short extract is given from a paper by Dr. Dewar, of Kircaldy, who has drawn attention to the useful action of sulphurous acid in various diseases.

Dr. Dewar applies the sulphurous acid in three ways,—as a solution, by fumigation, and by the spray-producer. He asserts that chilblains and chapped hands are speedily cured by solutions or by fumig ation. Equal parts of the acid of the pharmacopœia and of water or glycerine, he asserts, will at once ease the burning, and prevent the spread of erysipelas. Wounds and sore nipples may be treated with the solution, either neat or diluted, constantly applied. Bruises, it is said, may be prevented, or quickly removed, by the same treatment.

According to the same authority, many internal diseases are equally amenable to sulphurous acid; amongst others, cold in the head, influenza, tonsillitis, malignant sore throat (scarlatinal or otherwise), laryngitis, chronic bronchitis, chronic phthisis, asthma, croup, clergyman's hoarseness, and typhoid fever.

The acid may be applied to the throat by fumigation or by inhalation: a few drops being added to boiling water, the steam is inhaled. It may be applied also by a camel-hair brush, or by the spray-producer.

It may be carried into the lungs by fumigation, inhalation, or by the spray. The pharmacopœia acid is used, which, if properly and carefully employed, excites scarcely any irritation and annoyance. The application of sulphurous acid may be conducted in the following ways:—

"Put a few red cinders into a kitchen shovel, set this upon a wooden stool, and then sprinkle flowers of sulphur from time to time till the room is not inconveniently filled with smoke."

The spray may be applied by a vaporizer composed of vulcanite, constructed upon Dr. Dewar's plan. For children, the instrument should be held about three feet from the mouth, and the fine spray should be inhaled. This may be repeated according to circumstances. If the disease is acute, and no time can be lost, it may be repeated hourly, or even oftener.

In applying the spray to adults, Dr. Dewar advises "to hold the nozzle of the instrument about six inches from the patient's mouth, and administer three or four whiffs to begin with; then, after a corresponding interval, during which a cough or two is given, the process is repeated, about twenty squeezes in all, which represents the injection of from forty to sixty minims of acid. The acid should be pure."

For the relief of rheumatism and gout, Dr. Dewar advises, besides the fumigation, that the bed-clothes should be exposed to the strong fumes, and then spread over the patient. Sweating breaks out, and, after a refreshing sleep, the patient wakes much relieved.

The solution, either strong or diluted in various proportions, is an excellent wash in thrush, which it speedily removes. Dr. Lawson speaks highly of sulphurous acid as a remedy for pyrosis; indeed, he says it never fails to be of service. The sulphite he has found useless.

In five- to ten-drop doses, sulphurous acid will often prevent flatulence, produced by fermentation. It seems especially useful when the gas is abundant. It is more efficient than sulphites and hyposulphites.

Administered by the mouth, sulphites, it is said, will prevent decomposition and putrefaction of the urine in the bladder.

Sulphites and hyposulphites have been employed to destroy sarcinæ and torulæ in the stomach.

CHROMIC ACID.

Chromic acid was first used as an escharotic by Mr. John Marshall, of University College. He employed it to remove warty growths from the nose, genital organs, and elsewhere. Immediately after touching the parts with chromic acid, Mr. Marshall applies lead lotion, "which restrains the subsequent inflammation, relieves the subsequent soreness, and does not in any way neutralize or retard the rapid effects of this apparently useful escharotic." He uses a solution containing a hundred grains of crystallized chromic acid to an ounce of water. "The solution is best applied by the aid of a pointed glass rod, or, when a large quantity is needed, by means of a small glass tube, drawn to a point. Only so much should be applied as will saturate the diseased growth, avoiding the surrounding healthy mucous membrane, for, though the solution is not sufficiently powerful as an escharotic to destroy or even vesicate the mucous membrane, it may give rise to an unnecessary amount of inflammation." "Any superfluous acid may be removed by a piece of wet lint. The first effect of its application to the warts is to produce a slight smarting pain. If, however, any ulcerated surface be touched, the pain is of a burning character, more lasting, but not so acute and intolerable as that caused by nitrate of silver or by nitric acid, with or without arsenious acid. Under its influence the morbid growths rapidly waste, in some cases being thrown off altogether, and in others undergoing a partial, though evident, diminution in size. The best immediate dressing is dry lint, afterwards the part may be washed with lead lotion, and dressed with lint moistened in the same." "In most cases one application suffices, the cure being completed in from four to eight days. In severe cases, where the warts are large, repeated applications are necessary." Mr. Marshall further states that "chromic acid solution neither burns nor stains linen; it all washes out."

A solution of this acid is said to allay itching, but the kind of itching is not mentioned.

Group containing CAUSTIC POTASH, SOLUTION OF POTASH, CARBONATE AND BICARBONATE OF POTASH, ACETATE OF POTASH, CITRATE OF POTASH. The corresponding preparations of Soda—POTASH SOAP, SODA SOAP, BORAX.

The members of this group are all endowed with very high diffusion-power, the potash more so than the soda salts. All are very freely soluble in water. With the exception of the acetates and citrates of potash or soda, they have an alkaline reaction, weak in some, as the biborate of soda, but very marked in others, as caustic potash or soda.

Some of these substances have a strong affinity for water, and can abstract it from animal tissues, so as to completely destroy them. This is especially the case with the caustic salts, less so with the carbonates, and in a very slight degree with the bicarbonates and acetates.

They dissolve the nitrogenous constituents of the animal textures, which property is in proportion to, while it is distinct from, their affinity for water.

We wish in this place to draw attention prominently to one important property of alkalies, namely, their power of increasing the secretion of the gastric juice, itself an *acid* secretion. We venture to think that the following, conjoined with other facts, warrants the following generalization:—that alkalies applied to the orifices of glands whose secretions are acid, increase their secretion; while, if applied in a corresponding way to glands whose secretion is alkaline, this is lessened or checked. As we proceed with the consideration of this group, we shall find reason to believe that this general proposition is true, and that, affording an explanation of many effects of alkalies on the body, it gives us a clue to their employment in disease.*

Owing to their affinity for water, and their solvent action on the nitrogenous tissues, several of these substances will destroy the skin or other structures to a considerable depth. The caustic alkalies, possessing a greater affinity for water, and a more solvent action on the tissues than the remaining members of this group, are the most efficient in this respect. The carbonates and solutions of the caustic alkalies come next; while the bicarbonates, acetates, and the rest of this group, are comparatively feeble agents.

The caustic alkalies, undiluted, or sometimes mixed with caustic lime to lessen their activity, are not unfrequently employed to destroy warty growths or the hard edges of some unhealing sores, such as chancres, or to open abscesses, or to make issues.

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* In the *Medico-Chirurgical Review* for April, 1870, the author's attention has been directed to some remarks by Kühne, in his "Physiological Chemistry," apparently opposed to this general statement. He asserts that alkalies, as well as acids, stimulate the secretion of the submaxillary gland. The secretion produced by alkalies is thick, whitish, and cloudy; but that excited by acids is clear and less viscid. An identical difference in the characters of the secretions from the submaxillary gland is observed according as the cerebro-spinal or sympathetic nerve supplying this gland is irritated. Irritation of the sympathetic excites a secretion identical with that produced by alkalies; while irritation of the cerebro-spinal nerves excites a secretion identical with that produced by acids. Hence it is inferred that alkalies act on this gland through the sympathetic, and acids through the cerebro-spinal nerves.

No doubt the saliva produced by acids and by irritation of the cerebro-spinal nerves is a true secretion; for it is abundant in quantity, and quickly changes starch into sugar; and irritation of this nerve so greatly increases the flow of blood to the gland that its veins pulsate, and their blood is of a bright arterial tint. It is doubtful, however, if the fluid produced by the influence of alkalies or irritation of the sympathetic nerve is a secretion; indeed, Kühne thinks it is due to rapid degeneration of the gland. Thus, the quantity of fluid produced by alkalies is very small, and that obtained by irritation of the sympathetic requires many hours to produce even a trace of sugar in a solution of starch. The fluid thus obtained contains large quantities of very pale gelatinous bodies, of different forms and sizes, composed partly of albumen and partly of mucin. Moreover, by the irritation of the sympathetic nerve, the flow of blood to the gland is retarded, and the blood in the veins is dark and venous in tint. Alkalies produce very little secretion from the parotid gland, and so far as is at present known, none is excited by irritation of any branches of the sympathetic nerves.

When employed for these purposes, it must be borne in mind that, with the rest of this group, the caustic alkalies, possessing a very high diffusion-power, will penetrate the tissues, and destroy them widely and deeply. And so it often happens, unless great care is taken, that a much larger amount of destruction is effected than is desired, so that not merely the wart or the skin sufficiently large to make an issue is destroyed, but, by the diffusion of the alkali, a large slough is produced, followed, of course, by an equally large sore. To avoid this excessive action, the application of the alkali should always be checked before it has taken full effect, since for some hours after, the destruction will continue. Other precautions must be observed, or the caustic alkali dissolved in the fluids of the tissues will run over a large surface, subsequently destroying it. It is therefore desirable, as soon as the application is finished, to wash the surface with vinegar and water, to neutralize any of the alkali which remains on the surface of the skin. Another precaution is advisable. Pieces of plaster, with a hole in them the size of the desired issue, should be placed one over the other, and the caustic applied to the skin exposed through the hole, while the neighbouring parts are thus efficiently protected by the plaster. The caustic, very slightly moistened, should be rubbed on the surface till it assumes a dull bluish look, and till the cuticle is softened, and easily rubs off. The application should then be discontinued, and a poultice applied, which helps to separate the dead parts, and to ease the pain.

The itching accompanying many skin diseases may often be allayed by sponging the troublesome part with a solution of one of this group. A weak solution of the caustic salt, or of its carbonate, is best. A solution of carbonate of potash or soda, containing a drachm of the salt to a pint of water, applied with a small piece of sponge, is often of extreme comfort to persons afflicted with urticaria or lichen.

A solution of the same strength of cyanide of potassium, which has also a strong alkaline reaction, is a still better application.

The itching of many other eruptions, as of scabies, eczema, pruritus ani, and pruritus vulvæ, and prurigo from lice, is better treated by other applications, which are indicated elsewhere.

The carbonates of the alkalies are employed either as soap, or in the form of ointment, in the treatment of itch, to remove the superficial and dead cuticle, and so to break up the burrows of the itch insect.

The removal of the scales of psoriasis is facilitated by the employment of soap, by virtue of the alkali it contains.

In the treatment of eczema, a weak solution of carbonate of potash or of soda finds much favour with some medical men. The author has no doubt of its great usefulness in the early and middle stages of the disease, when there is copious weeping from the red and raw surface; but when the weeping has ceased, and especially when mere desquamation remains, the alkali ceases to be of use, and other applications are preferable.

The strength of the solution recommended by Dr. Hughes Bennett is half a drachm of the carbonate of soda to a pint of water. The surface affected with the disease is to be kept constantly moist by a thin piece of lint soaked in the solution, and the whole is to be covered with oil-skin, or with a piece of lint, on which simple ointment is spread. This, like the oil-skin, prevents evaporation, but is less "heating," and so is more comfortable to the patient. A weaker solution acts sometimes still better. This treatment is an instance of the general proposition (*vide* p. 98) of alkalies as local applications, checking an alkaline secretion; for the fluid which so abundantly oozes from the eczematous surface being strongly alkaline, the application checks very speedily the abundant weeping.

It must be admitted, however, that in some instances the alkali appears to irritate the skin, a result often due to using a much stronger solution than that recommended above. During this treatment due attention must be paid to the state of the digestive organs, and any irritation as that depending on teething or worms should be removed.

It is sometimes useful to wash the moist and weeping eczematous surface night and morning with soap and water, which in many cases checks the secretion, and allays the heat and irritation. If a strong soap is too irritating, a milder one must be used. In the chronic forms of eczema, Hebra recommends the application of liquor potassæ or of stronger solution of caustic potash. Liquor potassæ is to be brushed over the surface once a day, and if it produces much smarting, the application must be washed off with cold water. When the skin is only slightly infiltrated and thickened, he employs a solution composed of two grains of caustic potash to an ounce of water; but if the infiltration is greater, he uses a solution containing from five to thirty grains or more to the ounce. These stronger applications must be employed only once a day, and must be speedily washed off with cold water. This treatment speedily allays itching, but is liable to make the skin brittle. To obviate this condition, Dr. McCall Anderson applies every night, either cod-liver oil or glycerine. Dr. Anderson frequently employs alkalies in conjunction with tar or oil of cade. He recommends the following prescription: "Equal parts of soft soap, rectified spirit, and oil of cade. A little of this is to be firmly rubbed over the eruption night and morning. It should be washed off before each re-application. It is right to mention that Mr. Startin condemns the use of soap in this and in any skin disease, and uses as a wash either yolk of egg and water, or milk and water.

Pityriasis of the scalp may be very effectually treated with a saturated solution of borax in water. The head should be sponged with this several times a day. It eases the itching at once, loosens the scales, and so cleans the head. Often the disease gives way, and yields, in a short time, to the treatment; although, unfortunately, after a variable period it generally returns, which indeed happens when the disease is removed by other treatment. Should the pityriasis prove rebellious, the glycerine of borax will often prove more useful, as it keeps the scalp continually moist with the weak alkaline preparation. This plan is also useful in eczema of the ears and scalp.

Acne punctata is efficiently treated by washing the face, or other parts affected, with hot water and plenty of soap several times a day. The orifices of the sebaceous follicles are kept open, and the accumulation of the abundant secretion is prevented. If by this treatment the skin becomes rough, red, and painful, it should be well rubbed with glycerine of starch after each washing.

The intertrigo so often met with about the buttocks of children, or in the folds of the skin when they are fat, or under the breasts of fat women, is effectually treated by free ablutions with soap and water, which decompose and remove the acid irritating secretions which keep up the disease. After washing and carefully drying the parts, they should be smeared over with some greasy application, which, in the author's judgment, is generally preferable to a dry one, such as starch powder or oxide of zinc. Caustic potash or soda are sometimes used to open abscesses. It is stated that this method prevents scarring.

Alkaline baths are often employed, but their action on the skin and its secretion is not yet satisfactorily determined; like acid or simple baths, they lessen the acidity of the urine.

Pityriasis of the face is often caused by using soap too strong in alkali. It will often disappear at once if a milder soap is substituted. "Compressed glycerine soap" or "solidified glycerine" may be used.

A weak solution of bicarbonate of potash or soda, of a drachm of the salt to a pint of water, is useful as an injection to check leucorrhœa, when this discharge is dependent on an increased secretion of the glands of the os uteri. This secretion is strongly alkaline, and when unduly abundant, the efficacy of alkaline injections to check it is another proof of the general proposition made at the commencement of this section, that alkalies, applied locally, check alkaline secretions.

When the leucorrhœal discharge is clear, like white of egg, or when it is lumpy, but not yellow, this injection will check it, even after the third or fourth application. When, on the other hand, the discharge is yellow, and consists of pus, the injection may fail to do any good, although, in many cases, when this yellow discharge is due to mere abrasion of the os uteri, if the injection be continued for one or two weeks, the yellow becomes changed to a white discharge, and soon even this ceases. If the leucorrhœa is produced by the displacement of the uterus, or ulceration of its neck, the injection, like many others, may temporarily check the discharge, but it soon returns. In such cases the leucorrhœa cannot be cured till these conditions are removed.

It is obvious that the success of this injection depends entirely on its reaching and coming well in contact with the os uteri, the offending part; hence it is necessary to give full and careful directions as to its use. The patient should be directed to lie on her back, to raise the buttocks by placing a pillow under them, and then to introduce the syringe as far as she conveniently can, and to leave the injection in the vagina for about five minutes. The injection should be used cold, and be employed twice or three times in the day. A Kennedy's syringe—by means of which any quantity of lotion may be forcibly injected, and which, by washing away the discharges, and douching the part with a cold medicated application—is even more effectual.

Mr. Norton, of St. Mary's Hospital, ingeniously employs a solution of liquor potassæ (two drachms to the ounce of water) in the treatment of ingrowing toe-nail. "A piece of cotton-wool is saturated with the solution, and pressed gently down between the upper surface of the nail and the soft tissues. The solution permeates the substance of the nail, and softens and pulpetizes the superficial cells. The wool is kept constantly moist with the lotion, and the softened tissue is wiped away each morning. The nail in a few days becomes thin and flexible, and, if desired, it can be pared away without pain. The lotion should be continued until all ulceration has disappeared."

Borax is recommended by Sir J. Simpson in "the pruriginous eruption which appears on the mucous membrane of the vulva, and extends up along the vagina as far as the cervex uteri. It may also extend, and is sometimes indeed originally situated on, the cutaneous border of the vulva, and appears on the outer cutaneous surface of the labium, spreading backwards along the perinæum to the circle of the anus. Accordingly it is a flitting and transient affliction, recurring with menstruation, pregnancy, or delivery. It may be more fixed, and last weeks, or months, or years, producing constant irritation and distress, frequently interfering with rest and sleep, and rendering the victims miserable and almost deranged when the disease has become somewhat chronic, and necessitates the patient to attempt to alleviate it by constant and sometimes rough friction. The mucous membrane becomes at the most irritable parts white, and thickened with red fissures." This distressing complaint, Sir J. Simpson says, "may be generally cured by the assiduous and persevering application of a solution of biborate of soda (five or ten grains to the ounce of water)." The efficacy of borax is much enhanced if applied as a hot solution. Water alone, as hot as can be fairly borne, will often allay this itching; but hot water with borax is much more efficacious. If this treatment fail, infusion of tobacco may be tried; or an ointment of iodide lead (ʒi to ʒi), or an ointment of bismuth and morphia. Chloroform, as vapour, liniment, or ointment, is often found very useful; a drachm of chloroform may be added to an ounce of some sedative liniment or ointment. A strong lead lotion or a solution of nitrate of silver often does good. Dr. Simpson says, "There is great advantage in alternating these local applications; for most of them begin to lose their effects when persevered in above a few days. In the most obstinate and severe cases strong astringents are sometimes of the greatest use, as a strong solution of alum or tannin."

Strong solutions of lithia salts have been lately employed by Dr. Garrod to remove gouty enlargements. Gout-stones are composed of urates. Urate of lithia being the most soluble of uric acid salts, a strong solution of a lithia salt is applied with the intention of converting the urates in the tissues into urate of lithia, and so to soak the urates out through the skin.* The swelling must be constantly enveloped in lint or rag kept moist with the lithia solution. This treatment, in Dr. Garrod's hands, has proved very successful. He has removed considerable enlargements, and restored suppleness and even free movement to stiff and useless joints. The author has employed this treatment with considerable success. It is especially useful when the skin over the gouty enlargement is broken. It is well known that a sore of this kind is extremely difficult to heal. The urates being intimately mixed with the connective tissue, and oozing very slowly through the wound, the lithia solutions dissolve and remove them, thus enabling the sore to heal. For this purpose the citrate of lithia is to be preferred; but a strong solution of citrate of potash is nearly, if not quite, as useful. It probably converts the biurates into neutral urates. In this more soluble form the urates are carried off through the skin. Equal parts of citrate of potash and water may be used. Neither the solution of citrate of lithia, nor that of citrate of potash, irritate the skin. As might be expected, this treatment takes many weeks, or even months, to effect considerable reduction of large deposits.

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* Dr. Garrod thinks that the lithia salt formed with the uric acid passes into the blood, and that in this way gout-stones are reduced. He employs carbonate of lithia, five grains to the ounce.

If the theory propounded at the beginning of this section is sound, we should expect that these remedies would check the secretion from the salivary glands, since this fluid has an alkaline reaction. But of their influence in this respect we have already spoken.

Of the diseases of the mouth, the only one treated by any of the members of this group is aphthæ, in which the mucous membrane is covered with usually small, round, sharply cut superficial ulcers, covered with a pultaceous exudation. This disease is often treated with borax and honey, or the glycerine of borax. Apthæ runs naturally a short course, and when left untreated gets well in most cases in a week or ten days.

The action of the members of this group on the stomach has been somewhat anticipated when it was stated that alkalies possess the power of increasing the secretions of the gastric juice, and may thus prove useful to promote digestion. It is obvious, however, that method must be observed, or the contrary effect to that intended will result; for if given soon after a meal, the alkalies will neutralize the acid of the gastric juice, and so very effectually retard and impede digestion. That the alkalies, by increasing the quantity of gastric juice, may promote digestion, they must be taken a short time before the meal. In this way the alkaline saliva swallowed at the beginning of a meal is highly useful; although, as it must speedily become neutralized by the acids of the stomach, its action can continue for a short time only. Alkalies may very usefully be given in many forms of atonic dyspepsia, and in other forms associated with a deficient secretion of the gastric juice. The bicarbonate of soda is the salt most generally employed.

When, on the other hand, a patient complains of heartburn and acid eructations, these disagreeable symptoms may be removed at once by the exhibition of an alkali, as the bicarbonate, which neutralizes the excess of acid on the stomach. But it must always be remembered that such treatment is merely palliative. No doubt a course of alkaline treatment appears sometimes to remove acidity; but the good which is observed to follow the employment of alkalies may, with great probability, be ascribed to the tonic generally combined with them. On account of their milder action, the bicarbonates are preferred to the more caustic salts, while the acetates and citrates are neutral, and become alkaline only by decomposition in the intestines or blood. On account of their milder action, the bicarbonates can be continued longer than the more caustic preparations; but they have the disadvantage of giving off much carbonic acid gas, which may cause trouble from distension of the stomach. To prevent this, magnesia, which is an alkali, and acts like this group, may be substituted if the bowels are confined, or lime-water if they are relaxed.

Alkalies are apparently sedative to the stomach, at least they often relieve the pain of disease of this organ. Liquor potassæ is generally employed in such cases.

In cases of poisoning by the acids, those alkalies only which irritate the stomach but slightly are employed to neutralize the acid, and so to prevent its further action on the tissues.

In poisoning by metallic salts and alkaloids, the same salts, namely, the bicarbonates of the alkalies, may be used, as they precipitate the insoluble oxide of the metal or of the alkaloid. For this purpose magnesia is generally preferred, as it acts as a slight purgative, and so expels the poison from the intestinal canal.

Owing to their diffusion-power, the substances contained in this group pass so readily into the blood, that but a small portion of them reaches far into the small intestines. Of their action on the small intestines, and on the organs which pour their secretion into them, but little is known; yet we can conceive that those secretions having an alkaline reaction may be affected in a double and opposite way, according to the time these drugs are administered, thus acting contrariwise on the stomach. The secretion from the intestinal glands is alkaline; hence, if the general statement made at the beginning of this section is valid, acids applied to the orifices of their ducts should augment their secretion, while alkalies should have the contrary effect. But we have seen that alkalies, given before meals, increase the secretion of the acid gastric juice, and thus augment the acidity of the intestinal canal; and so employed they should increase likewise the biliary and pancreatic secretion. On the other hand, the alkalies, if given after a meal, neutralize the acid in the stomach, and should then lessen the secretion from the liver and pancreas. On these questions nothing is known with certainty, the above statements being at present mere conjectures.

The milder alkalies, as the bicarbonates of potash, soda, or magnesia, may be used with great benefit in diarrhœa due to excess of acid in the intestines. By neutralizing the excess of acid, these substances arrest the diarrhœa.

Soap is often added to anal injections, to suspend castor oil or turpentine. Soap, moreover, may be used as a mild and safe purgative. A piece the size of the thumb, covered with castor oil or merely wetted with water, and thrust up the rectum as high as the finger can carry it, will, in a short time, produce an easy, copious, and natural evacuation. This plan is especially useful for infants and children.

On entering the blood, these substances undergo various changes, according to their composition. The acetate or citrate, which has not already undergone a like change in the intestines, is converted into the carbonate, the form probably ultimately assumed by the oxides of the alkalies.

The alkalinity of the blood must therefore be heightened by these alkalies, not probably to a very great degree, as from their high diffusion-power they are rapidly eliminated by the kidneys. On this increase in the alkalinity of the blood much speculation has been built. The alkalies are known to promote oxidation, whence it has been conjectured that by increasing the alkalinity of the blood, its oxidation, and that of the tissues, may be increased. It has been suggested that alkalies might be employed with profit in diabetes, to promote the oxidation of the sugar. They have also been advocated for excess of uric acid in the urine, with the expectation that this product of the nitrogenous tissues may become oxidized, and so converted into urea or some other substance. And they are sometimes given to fat people to increase oxidation, in order to consume their fat, and so to control unseemly obesity. The solutions of the oxides or the bicarbonates, especially the former, are used for this purpose.

In diabetes their action appears to be nil, or rather, it should be said, they in no degree lessen the amount of sugar separated by the kidneys, although, if long persisted in, some derangement of the stomach must occur, with diminution in appetite, so that less food being taken, less sugar is excreted.

Nor does it appear that they can oxidize uric acid in the blood; at least, there are no experiments in proof of this. It is, however, of much service to render the urine weakly acid, or even alkaline, so as to convert the excessive quantity of uric acid into a more soluble urate. By this treatment the growth of uric acid calculi may be prevented.

With young male children it happens not unfrequently that micturition causes severe pain, which is seen to depend on the existence of uric acid or biurates, in the form of spicular crystals, which in their passage irritate the urethra. These are dissolved and rendered innocuous by alkalinizing the urine.

The salts best adapted to render the urine less acid, or to make it alkaline, are those which have very little action on the mucous membrane of the stomach. The citrates, in such instances, are to be preferred.

Next, as to the power of alkalies to increase the oxidation of fats. That by the long-continued administration of the more alkaline preparations much wasting of the body may be induced, admits of no doubt, but this wasting is effected by their disordering action on the mucous membrane of the stomach. It is highly undesirable to diminish fatness in this way, so likely to damage the health, and even to endanger life. Some writers of authority, however, maintain that obesity may be thus reduced without any ill effects on the mucous coat of the stomach. Thus, Dr. Neligan states that by the use of liquor potassæ he has often removed an uncomfortable excess of fat, without in any way injuring the patient's general health. This treatment, though possibly occasionally successful, generally fails signally.

After their passage into the blood, and their conversion into carbonate, the action of these substances on that fluid is at present but little known. Dr. Garrod is of opinion that scurvy is due to deficiency of potash salts with the food, a surmise supported by many facts, but not yet confirmed by exact observation.

The bicarbonate or the citrate of potash is often employed in rheumatism. This disease is supposed to be produced by an excessive formation of lactic acid, which, having an affinity for certain tissues of the body, excite in them the rheumatic inflammation. Alkalies are given to neutralize this acid, and to protect the tissues from its action. But so little is known about the nature of rheumatism, that it is impossible to approach the question of its treatment on the theoretical side, and our conclusion respecting the usefulness of this method must be decided by experience alone. As careful records of exact observations with this treatment are non-existent, we can only be influenced at present by individual impressions. This much must, however, be conceded, that in many cases the pain of rheumatism is much relieved as soon as the patient is well under the action of the remedy, and the urine has become fairly alkaline.

Many eminent authorities are firmly convinced that rheumatic fever, treated by alkalies,* is made both milder and shorter, and that the danger of heart complications is diminished. The author has made many careful observations on this question, and he is led to believe that, due attention being paid to the age of the patient, and to the nature of the rheumatism, it will be found that these salts are unavailing to lessen the intensity or the duration of the fever. In treating rheumatism in this manner, it is considered desirable to keep the urine alkaline. This can generally be accomplished by thirty or forty grains of either the citrate or bicarbonate of potash, taken every two hours.

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* In the fifty-second volume of the *Medico-Chirurgical Transactions*, Drs. Gull and Sutton have published a paper on the value of remedies in rheumatic fever. Although not numerous enough to settle this much-vexed question, these cases lead them to the conclusion that alkalies, lemon-juice, or blistering, are inoperative in shortening the course of rheumatic fever. They do not deny that these remedies may allay pain; they further conclude that neither alkalies, lemon-juice, nitrate of potash, nor blisters, prevents the occurrence of heart disease in rheumatic fever.

Potash salts exist abundantly in the milk, whence it has been suggested that the administration of these salts may promote this secretion. They are also recommended by some in amenorrhœa, in syphilis, and scrofula.

The sustained administration of the alkalies and their carbonates, it is said, renders the blood poorer in solids and in red corpuscles, and impairs the nutrition of the body. These results are probably due to disordered digestion, produced by the long-continued use of alkalies, and are not dependent on an excess of alkalinity of the blood; for such excess must always be slight, on account of the rapid elimination of these salts by the kidneys; moreover, it has been shown by Dr. Roberts, of Manchester, that the citrate of potash may be taken for an almost indefinite time without deranging the general health, yet the citrate increases alkalinity of the blood, while, owing to its neutral reaction, it is harmless to the stomach.

Liquor potassæ is reputed to possess the power of promoting the absorption of inflammatory formations, and is occasionally employed in pleurisy. But its good effects are not very conspicuous, and the disorder it produces in the stomach renders it unadvisable to continue its use for any length of time.

What influence have the alkalies on tissue change? The action of liquor potassæ has been investigated by Dr. Parkes, who concludes that this medicine probably increases the disintegration of the nitrogenous substance of the body, and he believes that his experiments justify him in asserting that it also disintegrates the sulphur-holding tissues; for when liquor potassæ was administered, both the urea and sulphuric acid of the urine were increased. From its strong reaction, liquor potassæ cannot be given in doses sufficiently large to affect in any great degree the reaction of the urine, so that when it is desirable to make this fluid alkaline, the bicarbonates or citrates must be employed.

What action have they on the constituents of the urine? They are all reputed to be diuretic, but at present this is an assumption, although probably a correct one, as no exact observations have been made with these salts.

Before referring to the diuretic properties of these substances it will be as well to digress for a short space, and speak in general terms of diuretics.

By diuretics we understand medicines which act as eliminators of the urine; and we must distinguish diuretics from those medicines which, by promoting tissue change, cause an increase in any of the constituents of the urine. Diuretics merely separate from the system already existing products.

As the urine is a complex fluid, containing, besides water, many salts and other ingredients, we may have medicines which will eliminate one or more of these, but leave the rest unaffected. We may therefore have diuretics of water, or of urea, or of uric acid, etc. Again, the retention in the blood of materials which should be eliminated by the kidneys, may be due to a variety of conditions. The physical state of the kidneys may be altered, and these organs disabled, by disease of distant organs, as of the heart. Or, on the other hand, through insufficient oxidation and combustion of the effete products of disintegration, refuse materials may remain in a form unexcretable by the kidneys; and, lastly, the retention of the urinary ingredients in the blood may be dependent on organic disease of the kidneys themselves.

Thus, in one instance a medicine acting on some organ at a distance from the kidneys, as the heart or lungs, will be a diuretic; while in another those means which promote oxidation in the blood will prove diuretic; and, lastly, diuretics may act immediately on the kidneys by removing or altering those physical conditions which hinder the action of these organs.

How far do the members of this group act as diuretics? and in which of the foregoing ways? We cannot give very satisfactory answers to these questions.

First as to their diuretic action.

It is generally held that all these substances are diuretic, and, under diverse circumstances, they may possibly become so. Acctate of potash and acetate of soda enjoy the highest repute in this respect. Some careful observations have been made with these substances on persons in health, which have led to unexpected results. Thus it was found by Böcker (quoted by Parkes), "that so far from acting as a diuretic in health, the acetate of potash diminished the water, the urea, the extractives, and, in a remarkable manner, the earthy salts." Some valuable observations concerning the action of citrate of potash and acetate of potash, as diuretics in health, have been made by Dr. Nunneley on himself. He took daily, for twelve days, three to five drachms of citrate of potash. On an average, the daily excretion of water was increased by two ounces and a half, but the urea was lessened by eighty-four grains, and the solids by sixty grains. The acetate of potash in daily doses of two and a half to three and a half drachms exerted a similar influence in a somewhat less degree.

But should we expect medicines to act as diuretics or eliminators in healthy persons? In their blood there should be but little urea or uric acid to be eliminated, and we must be careful, therefore, how far we allow physiological experiments to guide us as to the action of diuretics in disease. That such caution is highly necessary is shown by an observation by Ranke, who, after giving acetate of potash, noticed a very considerable increase in the quantity of urine voided soon after, showing that this salt will sometimes act as a diuretic of water.

Having spoken of their properties as diuretics, we will endeavour to answer the second part of the foregoing question:—In what way do they act as diuretics?

It is not supposed that any members of this group act on organs remote from the kidneys. They may possibly act by promoting oxidation in the blood, and so reducing effete products to urea, in which form they are separated by the kidneys.

Some of these medicines are considered to be febrifuge, as the citrates and acetates. If so, they would act as eliminators of water, as on the decline of fever an increase takes place of the urinary water, previously held back in the system during the febrile state, and there often occurs simultaneously an increase in the solids of the urine. If, therefore, these substances will check fever, this increase of water and solids must, in some measure, be due to their action.

These alkalies are generally reputed to act as diuretics when the kidneys are diseased. Thus the citrates and acetates are given in acute and chronic Bright's disease. Some consider that, by making the urine alkaline, it is enabled to dissolve the organic, but diseased, matters which block up the uriniferous tubes in Bright's disease, and hinder the secretion of the kidneys.

It has already been mentioned that the members of this group render the urine less acid, or even alkaline; but we may here add that, strange to say, the amount of acid excreted with the urine is actually increased, although, being neutralized by the alkalies, it gives no acid reaction.

Of these remedies, the citrates and bicarbonates are constantly employed to make the urine alkaline, when the urinary organs are irritated or inflamed. They are used in cystitis and gonorrhœa. If in cystitis the urine, before it is passed, is already alkaline from decompositon of the urea, alkalies must be intermitted; for they would, of course, increase the alkalinity of the urine, and so promote still further the decomposition of urea, and the formation of carbonate of ammonia, as alkaline decomposes much more readily than acid urine.

When excess of uric acid occurs in the urine, it should be kept for a time alkaline; and Dr. Roberts, of Manchester, by many careful and ingenious experiments, has shown that uric acid calculi may probably be dissolved in the bladder, if the urine is maintained alkaline for some weeks.

We may here introduce a short account of some interesting experiments made by Dr. Paul Guttmann on the action of potash and soda salts. He confirms many of the conclusions arrived at by Claude Bernard and others. The results are singular, and scarcely in accordance with the experience of medical men of the action of these substances on the human body. We give a short summary of his paper:—

ON POTASH SALTS.—All potash salts are far more poisonous than soda salts.

All potash salts are equally poisonous and fatal in the same time, if applied in the same way.

Chloride of potassium, carbonate of potash, and nitrate of potash, in identical doses, are equally powerful to destroy life, and in the same time.

This happens even when the salt, previous to injection, is mixed with a solution of albumen.

The acid of the salt plays no part in the fatal result.

In poisonous doses great muscular weakness set in, first appearing in the hinder extremities; while in warm-blooded animals dyspnœa and convulsions took place. They lessened the frequency and force of the heart's beats, and sometimes made them irregular. This occurred with all potash salts.

Large doses at once arrested the action of the heart, which always ceased to act in the diastole.

Traube asserts that the action on the heart is effected through the vagi nerves. This view Guttmann considers erroneous, as, after the vagi were both divided, and the medulla removed, the potash salts still affected the heart as before, and even when the vagi was paralyzed by woorali the potash salts still acted as usual on this organ.

Whether their effect on the heart is owing to their action on the heart's substance, or on its ganglia, Guttmann cannot say. He states that these salts lowered the temperature of the body; but certainly to a very insignificant extent.

These salts act but slightly on the muscles, and not at all on the peripheral nerves, unless applied directly to them in a strong form. The loss of sensibility and motion is due to their action on the spinal cord, whose functions they paralyze. Their action is first evidenced and most expressed on the posterior part of the cord.

Soda Salts, in twice or three times the quantity in which the potash salt proved fatal, produced no effect on the system, except a passing weakness.

Even in larger doses, soda salts exert no action on the heart, cause no diminution in the temperature, and produce no apparent effect on the cord, brain, nerves, or muscles.

The heart of a frog suspended in a solution of potash quickly ceases to contract, while a solution of soda of similar strength required a much longer time to produce that effect.

Many soda salts produce an opacity of the lens in frogs. This is not noticed to occur with the sulphate of soda. Guttmann shows that the opacity is not due to mere abstraction of water from the lens.

This opacity does not occur in mammiferous animals. It is removed by immersing the opaque lens in water.

SOLUTION OF AMMONIA.
CARBONATE OF AMMONIA.
SPIRITS OF AMMONIA.

These preparations have many properties in common with the alkaline potash and soda group. They possess a strong alkaline reaction, are freely soluble in water, have a high diffusion-power, and dissolve the animal textures; but they differ from the potash and soda preparations in their volatility, and in being more powerful irritants of the living animal tissues, exciting in these, when applied locally, very active inflammation.

Their action on the skin is in many respects similar to that of the alkaline potash and soda preparations. Liquid ammonia, owing to the water in its composition, manifests but little attraction for that of the tissues; and since its solvent action is less than that of the soda or potash salts on the textures, it physically destroys these much less quickly and extensively. Owing, however, to its high diffusion-power it readily penetrates the cuticular covering of the body, and excites a degree of active inflammation, sufficient to destroy the tissues, and so produce, first a slough, then an ulcer. The preparations of the members of this group are never purposely employed to produce such destructive changes in the tissues, but, in the form of liniment or the solution of ammonia itself, are used as vesicants and rubefacients.

The strong solution may be employed when it is desired to produce very speedy vesication. A few pieces of lint are to be cut a little larger than the desired blister, and on these ten or twenty drops of the strong solution of ammonia are to be poured. This is to be immediately applied to the skin, and covered with a good-sized watch-glass. Heat, with some smarting and tingling, is soon felt, and in a short time a rim of redness appears around the glass. When this becomes marked, the application should be removed, and a poultice applied, which, while promoting the vesication, eases at the same time the burning pain. In this way a blister may sometimes be produced in ten minutes; sometimes it takes half an hour; but so great is the difference observed in respect of the vesicating action of ammonia, that with some a blister is not formed at all. It must be considered a very uncertain vesicant.

As a rubefacient or "counter-irritant" it is a more useful application. It is, however, in no respect superior to a mustard poultice, the materials for which are always at hand. The liniment of ammonia will act very imperfectly as a counter-irritant, if merely rubbed or dabbed on the skin. It must be applied on lint or linen, kept in contact with the skin, when, in a few minutes, decided rubefaction is obtained.

As a counter-irritant it is used for the same purposes as mustard poultices or blisters, and we must here refer our readers to the sections on these remedies. The weaker solutions of ammonia are sometimes applied to the bites or stings of insects, as wasps, spiders, etc. Formic acid, the active principle of this poison, is neutralized by ammonia, and so made inert.

Salts of ammonia are commonly used as restoratives in fainting and in poisoning by narcotics, when they are applied to the nose, and breathed into the air passages, and so rouse the patient to consciousness. They are used in the same way in the early stages of colds in the head, or as derivatives to remove pain and inflammation of the nose and frontal bones. Ammonia inhalations have been recommended in chronic bronchitis to ease and probably to lessen the over-abundant expectoration from the bronchial tubes.

In the stomach it acts much in the manner it affects the skin. As an alkali it neutralizes the acid in encounters, and is hence an antacid; at the same time, if not wholly neutralized, it acts as an excitant, or even irritant, of the mucous membrane.

Soon after its administration a feeling of warmth at the pit of the stomach sets in, which soon spreads to the rest of the body. As an excitant of the stomach and upper part of the intestines it may be used when their functions are depressed. It often obviates spasm of the intestinal canal, and braces up the relaxed mucous membrane. Ammonia compounds of this group are therefore among the best anti-spasmodics. They are useful remedies for children, especially for infants, who are frequently tormented by colic or flatulent distension of the intestines, generally owing to bad feeding.

In the after-stages of diarrhœa, after the removal of the irritating excitant cause, these preparations may be profitably employed, when the mucous membrane continues to pour out a watery secretion which perpetuates the diarrhœa.

The alkaline preparations of ammonia are employed in flatulent distension of the stomach and intestines, with the view of absorbing the excess of gas, generally consisting of carbonic acid. There is no doubt that these remedies are often temporarily useful in these affections, owing to their exciting the muscular coat of the intestine to contract, and so promote the expulsion of the distending gases. But in these cases they are merely remedial, and not curative.

In full doses these remedies excite an increased formation of mucus, and even vomiting. As emetics they act without nausea or depression. They are seldom employed alone, but are added to other emetics to obviate the depression these usually induce.

If too long continued, they excite catarrh of the stomach and intestines.

These substances readily enter the blood, and to some extent must increase its alkaline reaction; but from their volatility and high diffusion-power they are rapidly eliminated, and therefore exert only a transient action on the blood and the organs of the body.

The effect of ammonia on the blood is at present unknown. It has been maintained that carbonate of ammonia is the poisonous agent in uræmia; that the urea decomposes in the blood, forms this carbonate, which in its turn produces the serious symptoms constituting uræmic poisoning. This view is more than doubtful.

Ammonia induces a slight increase in the force of the pulse, some excitement of the brain, and a general feeling of warmth. Being a slight stimulant of the heart, ammonia is used in fainting and exhaustion. Ammonia is frequently administered as an antispasmodic—an action very probably depending, in part, on its power to strengthen the heart's action, but, like all other antispasmodics, its influence is but brief.

Carbonate of ammonia is often employed as a stimulating expectorant in chronic bronchitis, when the expectoration is profuse, and when the patient's strength is diminishing. It is often given with hydrochlorate of ammonia, which probably acts in a similar manner. Carbonate of ammonia is often of signal service in severe bronchitis, or broncho-pneumonia of children, especially when they are prostrate, and when livid from obstructed breathing.

Carbonate of ammonia, in three to five grain doses, administered every one, two, or three hours, according to the severity of the case, has been highly praised in scarlet fever. It was largely used by the late Dr. Peart, who, from the time he employed it, "did not lose one patient out of nearly three hundred." The late Mr. Wilkinson also employed it largely with equal success; and recently Mr. Charles Witt has written a pamphlet extolling its virtues. It is said to be useful in all forms of scarlet fever, especially when given early. The immediate effects of the remedy are stated to be diminution of heat, fever, and delirium, and a disposition to sleep. Mr. Wilkinson says it is equally useful in measles, and that when treated by ammonia, these diseases leave no secondary evils. Mr. Charles Witt says care must be taken that no acid drinks nor acid fruits of any kind are permitted, or the ammonia, becoming neutralized, loses its efficacy. It should be given alone.

These salts are reputed to be diaphoretics. A full dose of spirits of ammonia often speedily and surely restores reason and steadiness to drunken people. The supposed effect of these remedies to prevent iodism has been noticed at another place.

These substances escape very readily from the body in different ways, and owing to their high diffusion-power. A portion passes with the breath, some probably with the sweat, and much with the urine.

MAGNESIA.
LIGHT MAGNESIA.
CARBONATE OF MAGNESIA.
LIGHT CARBONATE OF MAGNESIA.
SOLUTION OF CARBONATE OF MAGNESIA.

THESE substances having an alkaline reaction, might on this account be placed in the group of potash and soda alkalies. In most other respects their effects on the body are very different. We have elsewhere treated of the properties pertaining alike to all alkaline substances, including, of course, the members of this group. (See Potash group.)

Some of the oxide combines with the acids of the gastric juice, and becomes soluble; the remainder is unaffected, and is left insoluble. Part of the carbonate, decomposed by the acids of the stomach, sets free the carbonic acid.

They act as antacids, and as antidotes in poisoning by the strong acids, and by some metallic salts. In some cases they are preferable, as antacids, to bicarbonate of soda or lime. The advantages of the members of this group are (1) their large saturating capacity for acid; (2) their purgative property; (3) when given in excess, they do no harm, on account of their insolubility.

Their disadvantage consists in their great bulk. As antacids, the oxide or carbonate of magnesia is generally used; but the oxide is preferable, as the carbonate, giving off much gas, may produce disagreeable distension of the stomach. They are merely temporarily remedial, and it must not be forgotten that acids are far better remedies for acidity of the stomach. (See Acids.)

The oxide of magnesia may be conveniently used as an antidote to the strong mineral or vegetable acids. These it neutralizes, and protects the delicate structures of the stomach from their corroding action. Many metals are precipitated by it from their acids, and are rendered less soluble, and so less poisonous. They form with arsenic an insoluble compound, and thus take rank among the antidotes of this poison.

These salts combine in part with the acids of the gastric juice. The oxide and carbonate cannot pass into the blood on account of their insolubility. Nor does the chloride, because of its low diffusion-power, pass in any amount. Hence almost all the magnesia passes into the intestines.

Here the salts of magnesia undergo changes according to their composition. The chloride probably is decomposed by the bile, and the oxide precipitated, part of which combines with the biliary acids. The oxide is first converted into the carbonate, then into the bicarbonate by the carbonate acid of the intestines, and so made soluble, and capable of acting on the intestines as a purgative. The carbonate is changed in a similar manner into the bicarbonate, and so becomes active as a purgative. Thus they act as purgatives only after conversion into bicarbonates, in which form they possess most of the properties of the group which contains sulphate of magnesia, etc. Like the members of this group, the bicarbonate has a very low diffusion-power, and, like them, it is purgative. Its action in this respect being, however, very mild, it is termed a laxative. Their mild action, freedom from taste, and antacid property, fit these substances admirably for children. They are generally combined with a little rhubarb. If unduly employed, they occasionally accumulate, and form concretions of ammonio-magnesian phosphates in the intestines.

Bicarbonate of magnesia, fluid magnesia, as it is termed, is a useful and mild aperient.

Magnesia has been lauded in sympathetic vomiting, as of pregnancy, when it is to be presumed the vomiting is dependent on an excessive secretion of acid from the stomach. Its effects are very transient. Should it fail, recourse may be had to oxalate of cerium (one grain every three hours), ipecacuanha, quinine, acids, etc. (See Ipecacuanha.)

Of these substances the chief part passes out with the fæces, and for the reasons stated a small portion only enters the blood. By saturating much of the acid in the stomach, and carrying this out of the body, members of this group lessen the acidity of the urine, and so prove useful when it manifests excess of uric acid.

LIME, CAUSTIC LIME, LIME-WATER, LINIMENT OF LIME, SACCHARATED SOLUTION OF LIME, CARBONATE OF LIME.

THIS group contains substances most valuable in medicine, and they might with advantage be more extensively used in disease.

Thus lime is a necessary constituent of the body's hard and soft tissues, both of bone and those parts more vitally endowed, as the nerves and muscles; wherever active growth, whether natural or unnatural, occurs, there lime salts are found in excess, probably as phosphate, being in all likelihood the form required by the body for the performance of many of its functions. In practice, however, we find the other salts of this group of great service in almost precisely the same states of health in which the phosphate is so valuable, and it seems feasible that after their entrance into the body a portion becomes united with phosphoric acid.

It will be convenient to mention in this place a few of the properties of this group. Their diffusion-power being very low, and having little affinity for animal structures, they produce very little change when applied to the skin. But caustic lime, having a strong attraction for water, will withdraw this from the dermis when deprived of its cuticle, and so to some extent effect the destruction of the tissues. Yet, as its diffusion-power is slight, it cannot penetrate the tissues, and consequently its action is but superficial. Caustic lime is not often used as an escharotic. Mixed with caustic potash, it forms a compound less deliquescent, far more manageable, and safer than simple caustic potash.

Applied to the broken skin and sores, the carbonate and lime-water are slightly astringent; hence lime is sometimes used to check the discharge from sores and skin eruptions.

Lime-water with oil, in equal quantities, or in the proportion of four of the former to one of the latter, enjoys a high reputation in the treatment of burns.

Lime-water as a lotion to cracked nipples is sometimes useful.*

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* But cracked nipples, if possible, should always be prevented, which is much easier than curing them. The nipple should be carefully washed and dried immedi-

Lime-water is sometimes employed to check the abundant discharge of certain skin diseases, as eczema. It is found to act at the same time as a sedative, easing the smarting and tingling. In eczema, where the inflammation has been subdued, but the discharge is great, lime-water and glycerine are a useful and comforting application.

Carbonate of lime is sometimes used as a dusting powder in eczema or intertrigo, with the intention of absorbing the abundant secretion, of preventing discharges from irritating the already inflamed skin, and of protecting the skin from the air. This powder, in common with other dry powders, is, in the author's opinion, inferior to some simple, bland, or slightly irritating, greasy application. Cases occur, however, which are certainly more benefited by dry powders, as oxide of zinc, bismuth, and carbonate of lime, than by ointments.

Carbonate of lime, as we have said, is used for intertrigo of the buttocks and perinæum of young children, to protect the skin from the irritation of the urine and of the air. As the irritation of cloths soaked in urine is very generally the cause of this eruption, it is obvious that greasy applications afford a more efficient protection, for the powder readily absorbs discharges, becomes itself irritating to the skin, and cakes and cracks, leaving parts of the surface exposed. The best treatment consists in frequent ablutions with soap and water, with greasy applications.

Lime-water, on account of its astringent virtues, may be used as a wash in discharges from the ears and vulva. It is of most service when some active inflammation is still present. In the chronic stages of ear disease it is far inferior to the glycerine of tannic acid, and other astringents.

Liniment of lime with cotton-wool is recommended by Dr. Joseph Bell to prevent pitting from small-pox. Cotton-wool cut in proper shapes is dipped into the liniment, and applied so as to cover carefully the face and neck, leaving apertures for the eyes, nose, and mouth. No crevice must be allowed, and a large hand-

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ately the child is removed from the breast, and the tissues may be hardened by washing them some short time before delivery, and after each suckling, with a little brandy and water. It is also a useful practice constantly to wear over the nipple a zinc shield.

kerchief must be tied over all. This dressing is allowed to remain until convalescence.

Lime-water is often useful as an injection in leucorrhœa. Its good effects are probably due to its alkalinity.

Chalk makes a good tooth-powder, and is to be preferred to powders with hard and angular particles, which wear away the enamel, and lay bare the dentine of the teeth.

Lime-water is occasionally used to lessen the discharge, and promote the healing, of inflammatory and ulcerative diseases of the mouth.

These substances neutralize the acid in the stomach, and are hence antacids; but other remedies are mostly preferred. These salts of lime are useful in poisoning by oxalic acid.

At present it is not easy to indicate precisely the therapeutic value of lime-water in vomiting, but few remedies are more useful in some forms of it. It is generally useful in chronic vomiting, and is worth a trial, should other remedies fail. It often arrests the vomiting from chronic ulcer of the stomach. It should be mixed with milk, either in equal parts, or in the proportion of one of lime-water to four of milk; and if the vomiting is incessant, the patient should be fed on this only, small quantities, a tea or table-spoonful being frequently administered. Young children not uncommonly eject much of their milk in large lumps. These lumps of curd may pass into the intestines, and escape with the motions, causing, in their passage, severe colic and much wind. Cows' milk is apt to induce this condition, as gastric juice coagulates it in lumps, while it generally coagulates human milk in fine flakes. Lime-water, by preventing this lumpy coagulation, checks this kind of vomiting. This vomiting is generally stayed at once; or, should it continue, the rejected milk is no longer curdled. In case of constipation, bicarbonate of soda should be substituted for lime-water. One-eighth of lime-water is generally sufficient; half a drachm to a drachm of bicarbonate of soda should be added to a pint of milk. These remedies both sometimes fail, and it may be necessary for a time to withhold milk from the child, and to feed him on sopped bread, water gruel, and chicken broth, or veal broth.

Again, in young children suffering from chronic vomiting and diarrhœa, and consequently wasting, lime-water is often of the greatest benefit. It improves digestion, and apparently assimilation, and obviates that highly irritating state of the urine, which so commonly occasions intertrigo.

Solutions of these salts pass but slowly into the blood, on account of their low diffusion-power, and so it happens that the greater part pass through the intestines, and are ultimately voided with the fæces.

These substances neutralize any acid present in the intestines, and check the secretion from the mucous membrane ; and sometimes by one means, and sometimes by both, act as astringents in diarrhœa.

Carbonate of lime and, in a less degree, lime-water deservedly hold a high place among remedies for diarrhœa. They are useful in the later stages, when the irritant is got rid of. Common chalk mixture is useful in the diarrhœa depending on more serious causes, as ulceration in phthisis or typhoid fever ; but in these cases other remedies are to be preferred.

It has been said that saccharated solution of lime does not confine the bowels, but, on the contrary, relieves constipation. It should not be taken on an empty stomach, lest it excite nausea.

Lime-water is reputed to be useful in whooping-cough, and this may well be, owing to its astringency : for in certain forms of this disease, astringents, such as alum and tannin, often effect a decided improvement.

Lime-water may be successfully injected into the rectum to destroy the thread worms which infest this part of the canal. It has been also used as an injection in gleet.

From their low diffusion-power, a small quantity only of these substances pass into the blood ; so small, probably, that it might be doubted if they could in any way influence the organs remote from the intestines. But experience shows that lime-water or carbonate of lime are valuable remedies in deficient nutrition, and in convalescence from serious disease. Their good effects are most marked in children, for whom they certainly appear to be invaluable in some stages of rickets, mal-nutrition, etc.

In some instances, but not always, these good results are traceable to the action of the lime salts on the mucous membrane of the intestines. The action of these lime salts, however, being very similar, although inferior, to that of phosphate of lime, we refer our readers to the section which treats of this salt. One circumstance may be noticed here, confirmed by both theory and experience, that when it is desired to obtain their influence on the remote organs of the body, since but little of these substances pass into the blood, as much good may be obtained from small as from large doses.

PHOSPHATE OF LIME.

Both in health and in disease this salt is of very great importance. It must be ranked among the most valuable and necessary foods, being probably as essential to proper growth and nutrition as the nitrogenous and fatty foods. Observations have abundantly proved its physiological importance. It gives solidity to the skeleton, and if the quantity supplied to the body is small, or if the demand for it is greater than the supply, these solid structures suffer and become soft. Chossat produced softening of the bones of animals fed on food free from lime salts; while, during pregnancy, much phosphate of lime being required for the ossification of the skeleton of the fœtus, it is found that fractured bones of women in that condition unite slowly and imperfectly.*

Some experiments by Milne Edwards bear practically on this point. He found that animals' bones intentionally fractured, united more quickly if the animals were made to take phosphate of lime. These experiments indicate the probable usefulness of this salt in promoting the union of broken bones.

But far greater than merely to give solidity to the skeleton, is the importance of this salt to promote cell growth and natural nutrition. It is a necessary food to the soft and growing tissues.

That this is a very feasible conclusion the following considerations tend to show:—

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* The urine of pregnant women is said to be deficient in lime salts; the evidence on this point is, however, very discrepant.

1. The presence of this salt throughout the body.

2. Its presence in much larger proportion in the intercellular fluid of the body than in the blood itself.

3. The fact that in herbivora the intercellular fluid is as rich in this salt as it is in carnivora, though the former take so little of it with their food; hence it must be carefully retained in the intercellular fluid for some important purpose.

(In respect to considerations 2 and 3, it must be borne in mind that phosphate of lime is soluble in acids, and as the intercellular fluid is acid, the phosphate would be expected to accumulate in this fluid.)

4. Schmidt's observations show "that a certain quantity of phosphate is required to supply the first basis for the new tissues, even in the case of those organs which subsequently exhibit an excess of carbonate of lime," as the shells of animals, an observation showing that phosphate of lime is necessary to growth, and in this respect is not interchangeable with the carbonate.

5. Wherever cell-growth is active, there phosphate of lime is in excess,—a statement holding good both in healthy and diseased growths; for in disease, associated with rapid formation, this salt is found to prevail.

Viewing the subject theoretically, it might be supposed that abundant knowledge exists to enable us to determine the occasions when to employ this salt remedially. In defective nutrition or deficient cell-growth it would be assumed that the phosphate of lime would be of service, and experience fully corroborates this inference. Certain theoretical objections have been urged against the employment of this salt. It has been said that the fault is really not due to deficiency of lime, but inheres in the tissues, which fail to assimilate it. It is urged that, in cases of defective cell-growth and of mal-nutrition, the quantity of the phosphate in the urine is unusually great; and, consequently, in such cases our efforts should be directed to remove those circumstances which check assimilation. It is as little reasonable, it may be said, to treat diabetes with sugar, as a diabetes of phosphate of lime with phosphate of lime. Some truth there is, no doubt, in this criticism, and too much attention cannot be paid to ensure those conditions which promote assimilation, as good air, abundant light, and sufficient exercise. These considerations are, though true in part, not absolutely so, for the case before us is more analogous to anæmia than to diabetes; and we treat with decided benefit anæmia with iron, even where this condition is due, not to want of iron in the food, but to the non-assimilation of it by the tissues. The efficacy of this medicine, however, must be decided by experience, and this speaks abundantly in its favour. Beneké, to whom on this subject we owe much of our knowledge, both physiological and therapeutical, has shown that phosphate of lime is especially useful in those very diseases wherein it occurs in excess in the urine, as hectic, and chronic disease accompanied by wasting.

This salt is found of great use in the anæmia of young and rapidly growing persons, and women weakened by rapid child-bearing, prolonged suckling, or excessive menstruation. In checking chronic tubercular and non-tubercular diarrhœa, and other profuse discharges, as in leucorrhœa, chronic bronchitis, and large abscesses, it is a valuable remedy, effecting in these states both general and local improvement. Beneké greatly praises its influence on scrofulous sores. It is useful also in caries of the bones.

Women living in towns are apt to have a deficiency of this salt. They are improved by its administration; an increased quantity finds its way into the milk of a suckling mother, and thus both she and her child are simultaneously benefited.

Persons in broken health from prolonged town life or overwork, or who from other causes are languid-hipped, and incapable of much exertion, are very much benefited by this medicine.* In the chronic forms of phthisis, with little or no fever, this medicine is useful. It should be taken on the tongue, either dry or mixed with a little milk.

Of the efficacy of phosphate of lime in many cases of rickets, the author thinks no reasonable doubt can be entertained.

It has been sought to establish a connection in all cases between a deficient supply of lime and rickets. In favour of this view it is urged that rickets occur most commonly during the first dentition, when much lime is required by the growing teeth; and that rickets affect the children of mothers in that condition of health in which it has been established that lime is deficient in their milk. There may be much truth in these statements; but as in many cases of rickets an excess of lime is found in the urine, the disease in such cases cannot be held to depend on a deficient supply of the salt, but must be due to other circumstances, with which, at present, we are only partially cognizant. In cases where the disease is dependent on deficiency of phosphate of lime, its administration is obviously all that is required.

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* In cases like this a good formula is a grain of phosphate of lime, phosphate of iron, and carbonate of lime; but phosphate of lime will act admirably by itself.

In rickets, however, we have not merely deficient ossification of the bones, but an unnatural growth and defective nutrition, both in the skeleton and in the other textures of the body. The phosphate of lime appears to control this defective and perverse nutrition, and to induce healthy growth, so as not merely to favour the consolidation of the skeleton, but to improve the condition of the soft organs. Experience shows abundantly that many rickety children are restored to health more quickly by lime salts than when other treatment is alone relied on.

German authorities who have studied this subject most attentively consider that the fittest time for giving this remedy is only after the cessation of the active stages of the disease, that is, when the pains and tenderness of the bones have disappeared.

It is well here to caution against the uselessness of administering this or other lime salts in large quantities. From their very low diffusion-power, very little passes into the blood. A grain or two grains, several times a day, is a sufficient dose.

Phosphate of lime in the stomach must be variously affected by the free acids, as lactic, hydrochloric, and, in a lesser degree, acetic acid dissolve it. Given in excess, it hinders digestion.

Most of the phosphate of lime taken into the stomach passes into the intestines, where, if its use is long continued, it is liable to form concretions. Being unaffected by the pancreatic and biliary secretions, and but slightly soluble in the intestinal juice, most of the phosphate passes off with the stools.

It is highly recommended in various forms of chronic diarrhœa, and especially that of young children, to whom it may be given with carbonate of lime and lactate of iron. Whether the beneficial effects are due to its direct action on the mucous membrane, or take place after absorption, in the manner previously described, our present knowledge does not enable us to decide.

Being soluble in the acids of the gastric juice, and to some extent in solutions of common salt, its passage into the blood takes place probably in several ways. It has, however, been doubted whether any portion, if uncombined with food, passes into the blood, since no augmentation of this salt is met with in the urine; nay, in some cases it seems even lessened. The observations on this point are, perhaps, too scant to set the question at rest.

Much phosphate is taken either in combination with the food, or so intimately blended with it that it is well-nigh impossible to separate it from the tissue-forming substances. So it finds ready entrance into the blood, with the digested materials constituting the chief, and in ordinary cases the only, source of phosphate of lime for the supply of the system. That so alkaline a fluid as the blood is capable of dissolving the phosphate is explained by its solubility in solutions containing free carbonic acid or common salt.

HYPOPHOSPHITE OF LIME.
„ SODA.

These medicines have been extolled for their efficacy in some forms of phthisis, and have found more favour with American than with English practitioners. In America they are used in other diseases besides phthisis, as "nervous and general debility." (See Phosphate of Lime.)

CHLORIDE OF POTASSIUM.
„ SODIUM.
„ AMMONIUM.

These substances having very many chemical and therapeutic qualities in common, they have been grouped together; but the remarks which follow in this section refer mainly to chloride of ammonium.

These salts are freely soluble, and possess a high diffusion-power. They have a saltish taste, which, in the case of chloride of ammonium, is very disagreeable, and constitutes one of the objections to its use.

They all increase considerably the secretion from the mucous membrane. They may even excite catarrh. This is notably the case with chloride of ammonium, which is consequently most employed when it is desired to influence the mucous membrane. How do they promote the formation of mucus? Let us take the instance of common salt. Salt is a large constituent of mucus, and when taken into the system it probably promotes the production of those secretions of which it forms a large part. It is, indeed, a food to the mucous membranes. This suggestive explanation may possibly apply to the other members of this group. These substances, and especially sal ammoniac, are not uncommonly used to remove catarrhal conditions of the intestines, and to prevent in them the formation of that thick tenacious mucus not unfrequently met with, which forms an excellent nidus for various worms infesting this canal.

Owing to their high diffusion-power, these salts pass rapidly into the blood, and cover too small a distance along the intestines to act as purgatives ; so that, unless administered in considerable quantity, they exert very little influence on the character of the motions.

Common salt is used to produce sickness, or to promote it after other emetics have been taken. Given in poisoning by nitrate of silver, it effects a double decomposition, the silver being precipitated as the harmless insoluble chloride.

Chloride of ammonium is often given with considerable success in chronic catarrhs of the bronchial and urinary mucous membrane. In chronic bronchitis, the secretion being thick and abundant, this medicine is indicated; and it may be applied topically to the diseased mucous membrane by the atomizer.

The same remedy has been lauded for whooping-cough. It is said to be frequently successful in removing the pain of facial neuralgia "of rheumatic character." It should be given in half-drachm doses, and if relief is not obtained by four doses the drug may be considered unsuitable for the case. These are the directions given, it is believed, by Sir T. Watson. The author has many times found it useful where the pain was undefined, shooting, and not limited to one part, but sometimes felt along the lower jaw, at other times over the malar bone, in the temple, or in the ear.

Chloride of ammonium has been employed with advantage in headaches due to menorrhagia, amenorrhœa, etc.

Common salt is sometimes successfully given to arrest hæmoptysis. Half a tea-spoonful should be taken undissolved, and be repeated till nausea is produced.

Dr. Parkes states that "muriate of ammonia is not oxidized, but passes out unchanged by the urine." "According to Böcker, it increases (in health) all the constituents of the urine, except the uric acid, which it slightly diminishes. The mean daily increase of the urea in these experiments was 4·793 grammes, or 74 grains, an amount which indicates a vast augmentation of metamorphosis or of elimination. The volatile salts and extractives were increased by no less than 18·959 grammes, or 292 grains, which was, no doubt, partly owing to the presence of the volatile chloride of ammonium." (Parkes on Urine.)

Group containing—
SULPHATE OF POTASH.
„ SODA.
„ MAGNESIA.
PHOSPHATE OF SODA.
TARTRATE OF POTASH.
BITARTRATE OF POTASH.
TARTRATE OF POTASH AND SODA.

With a slight alteration we have adopted this grouping from Buchheim's excellent work on therapeutics, and in the following description of the action of these medicines we are largely indebted to this authority.

With the exception of the sulphate and bitartrate of potash, these substances are freely soluble in water.

The sulphates have a very disagreeable bitter taste, which is but slight in the phosphate of soda, and is absent in the tartrates.

They are all purgative, producing watery evacuations, which action is probably due to their very low diffusion-power.

They have little or no affinity for animal textures, nor any powerful attraction for water, whence they effect few changes in the organic constituents of the body.

While they all act as purgatives, producing watery evacuations, they excite very little irritation in the mucous membrane. How do they produce their purgative effects?

Purgatives may act in one of two ways, or in both combined.

Some purge by increasing the moisture of the intestines, and so facilitating the passage of their contents along the canal; others act by increasing the peristaltic action of the intestines, so that the contents are more rapidly urged towards the rectum; while most purgatives combine both modes, although usually one action predominates over the other.

The watery character of the motions after the administration of any of these medicines shows without doubt that, in part at least, they purge by augmenting the moisture of the contents of the intestines, which can be effected in three ways. The medicine may cause water to flow from the blood into the intestines, or it may excite the mucous glands of this tract to increased secretion, or it may effect the retention of the water already present in the intestines. From Buchheim's careful observations it appears that these medicines purge in virtue of their power to retain in the intestines the water existing there, and in no other way. He concludes that they produce no flow of fluid from the blood, no increased secretion from the mucous glands, from the fact that, after the exhibition of any of these medicines, no albuminous substances occur in the fæces.

How do they retain in the intestines the water which they find there? These salts, as we have said, possess a very low diffusion-power; that is, they pass slowly, and with difficulty, through animal membranes. This property hinders their speedy transfer from the intestines to the blood, so that they are long retained in the canal As, however, they hold with some tenacity the water in which they are dissolved, or that encountered in their course through the body, they prevent this water passing from the stomach and intestines to the blood, and so the fluid in these cavities is retained. It is not generally held that the members of this group act purgatively by increasing markedly the peristaltic contraction of the intestines, since none produce much pain and griping. It appears then that these medicines are mere eliminators from the intestines, not of the effete matters present in the blood, although by emptying the intestinal canal they prevent contamination of the blood by the products of fæcal decomposition.

An excellent way to administer some of these salts is in the form of Pullna or Freidrichshall waters. They may be given in doses varying from a wine-glassful to half a tumblerful or more. Usually one dose before breakfast is sufficient; if not, a second, and even a third dose may be taken in the course of the day. It is advisable to mix the natural water with a third or an equal quantity of warm water; for if used cold, it is liable to "lie heavy on the stomach." Usually a wine-glassful of Pullna water, with an equal quantity of tepid water, is sufficient to open the bowels without much griping or pain.

The medicines now under consideration are not to be indiscriminately used. The bitartrate of potash is employed in both general and local dropsies, and more frequently in general dropsies, and is especially used as a hydragogue cathartic in Bright's disease. It is then given to withdraw superfluous water, and to prevent its accumulation to a dangerous degree in the cellular tissues, or in the cavities containing the important organs, as the heart and lungs. It is used also to draw off with the water the effete and poisonous matters which, in this disease, are retained in the blood. Being mere eliminators from the intestines, it may be thought that these remedies are ineffectual to withdraw either water or urea from the system; but a little reflection will show us this is not the case.

During digestion a considerable quantity of fluid is poured into the intestines by the stomach, the liver, and the pancreas. Now, if the blood contains poisonous matters, some portion of these must contaminate the fluids secreted by these organs. These medicines, retaining in the canal much of this fluid, until its expulsion through the anus, thus diminish the quantity of fluid of the body, removing simultaneously some of the poisonous matters accumulated in it. So far theory; and we find that experience supports it. The concurrent testimony of practical men bears witness to the fact that free purging with bitartrate of potash, or by other members of this group, lessens the fluid in the cellular tissue and cavities of the body, while the coma, convulsions, and other symptoms due to the poison in the blood, are often simultaneously removed. This treatment must be adopted with caution; for it must always be borne in mind that free purging is weakening.

It may be conveniently stated here that a brisk purgative frequently promotes a free and abundant secretion from the kidneys, either when healthy or diseased; and herein we have, perhaps, further elucidation of the good effects of these remedies in Bright's disease.

One or other member of this group—generally sulphate of magnesia, or phosphate of soda—is often given as an intestinal evacuant in fever; hence they are reputed to be febrifuge. But their action is due simply to their unloading the bowels; for it is well known that, in fevers, constipation augments the preternatural heat of the body.

Dr. Armstrong strongly recommended purgatives to be freely administered to fever patients during the few first days, before exhaustion had set in. He advised several evacuations in the day. In the present day this treatment finds—the author thinks justly—favour with many practical authorities, although disapproved by Dr. Graves. Some consider that free purgation in scarlet fever prevents the severe sore throat, the swelling of the glands, with many of the other disagreeable sequelæ, as discharges from the nose and ears.

In measles, the bowels generally are highly irritable, and diarrhœa is often present, so that purgatives must be given with caution.

The salts of this group most frequently employed are the bitartrate of potash, sulphate of magnesia, and phosphate of soda. This phosphate, well-nigh tasteless, may be given to children in a little broth, without their knowledge.

The sulphates are common ingredients in purgative natural waters, and are thus frequently taken in small doses in constipation or torpid liver. If the constipation is obstinate, a draught of these waters should be taken once or twice daily, since small doses, often repeated, act with greater certainty than a single large dose. Hence it is a good practice, when the bowels are tightly locked up, and have resisted the action of a full dose of Epsom salts, to give the same remedy in small and often-repeated quantities.

It must be mentioned that sulphate of potash, although usually a safe and mild purgative, has proved in some cases poisonous; hence its administration must be conducted with some caution.

On account of the low diffusion-power of these salts, very little passes into the blood, the greater part, especially where they purge, passing from the system with the fæces. Small doses, if they tarry long in the intestines, ultimately pass into the blood, and are separated by the kidneys. They are reputed to act as diuretics. The tartrates of this group are highly esteemed as excellent diuretics in Bright's disease, and are often so employed in doses short of purging.

The tartrates and bitartrates are converted into carbonates, partly in the intestines, and partly in the blood. They thus lessen the acidity of the urine, or even render it alkaline. The action of these salts on the constituents of the urine, either in health or disease, except in the case of phosphate of soda, has not yet been worked out.

As the action of phosphate of soda and of phosphoric acid appears to be nearly identical, we will speak of them conjointly. Our account of their action is taken from Dr. Parkes's work on the urine.

If Böcker's experiments on his own person are to be accepted as conclusive, the effects of these substances are highly singular. Thus he found that phosphoric acid always carried potash out with it, and that phosphate of soda changed its base, taking potash in its place.

Phosphate of soda, therefore, greatly lessens the quantity of potash in the body, and the acid would greatly diminish the amount of alkali in the blood, but for the singular fact observed by Böcker, that, while eliminating potash, both phosphoric acid and phosphate of soda caused a retention of chloride of sodium in the blood, to such a degree as actually to heighten the alkalinity of the body.

The effect of phosphate of soda is to lessen the urea in the urine, partly by the retarding effect it exercises on digestion, so limiting the supply of food to the system, and consequently diminishing the quantity of urea separated by the kidneys. But it appears that this diminution is due in part to lessened metamorphosis of tissue, since even when the salt is given on an empty stomach, the urea is still diminished. Phosphoric acid neither lessens the urea, nor affects the digestion.

For further information regarding the influence of these two medicines on the urine, we must refer our readers to Dr. Parkes's work.

NITRATE OF POTASH.
" SODA.

THESE salts possess a very high diffusion-power, and are freely soluble in water. They lower the temperature of water, an effect very considerably increased if sal ammoniac is mixed with the nitre. This combination used to be applied to the skin as a refrigerator, but it is now, however, rarely employed for such a purpose, and is to be especially avoided if the skin is broken; for solutions of the nitrate are very irritating to wounds. Ice is in every way a preferable refrigerator.

The inhalation of the fumes of burnt nitre-paper will sometimes avert a paroxysm of asthma. Dr. Hyde Salter points out that the paper must not imbibe too much nor too little nitre. If the bibulous paper is too thin, not enough nitre is absorbed; if too thick, excess of nitre will be taken up, and the fumes will be too carbonaceous; the paper burning too fast, with a sudden explosive flame. There should be no brown smoke, but clear white fumes. Red blotting-paper of moderate thickness and loose in texture is best. Dr. Salter gives the following directions for the manufacture of nitre-paper: Dissolve four ounces of nitre in half a pint of boiling water; pour the liquid into a small waiter, and soak the paper in it; then drain and dry it; cut it into pieces four inches square, and when required, burn one or two of these pieces, or a piece may be burned in the bedroom at night. The prepared paper must be kept in a dry place.

The crystals of nitre have a cooling, saline taste. They are sometimes sucked in acute inflammation of the throat. Other remedies are far preferable.

These salts, it is thought, while dissolving in the stomach, by absorbing heat, will cool this organ. This, indeed, is probably the case; but to be of any service in this way a sufficient quantity cannot be taken with safety. Ice or iced water is far more effectual.

In large doses the nitrates inflame the stomach. Even when taken for some time in moderate quantities, they considerably disorder digestion, producing nausea, vomiting, and a coated tongue. Consequently their action must be carefully watched.

How the nitrates excite inflammation of the skin or stomach is not yet explained; for if these tissues are soaked in solutions of these salts, no other change takes place than occurs from the action of simple water.

From their high diffusion-power these salts speedily enter the circulation. They pass but a short way along the intestines, unless indeed large quantities are taken. They do not, therefore, purge, and, as far as is at present known, have little or no direct influence on either the small or large intestines.

As regards the action of the nitrates on the blood, much conjecture has been hazarded. It is well known that they prevent the coagulation of the fibrin in blood withdrawn from the body, or dissolve it when coagulated. Scherer, however, asserts that they will not dissolve the fibrin of inflammatory blood. These facts have led to the supposition that the nitrates may possess a like influence over fibrin in the circulation, and are consequently indicated when this substance is in excess, as in inflammations and acute rheumatism. There is no proof, however, that they possess any such power. Unless employed in considerable quantities, the nitrates exert very little influence upon fibrin. Hence it cannot be expected that a harmless quantity, after its dilution with the fluids the circulation, can influence in any way the fibrin of the blood.

But, indeed, this notion is no longer tenable; for it has been ascertained that blood withdrawn from the body, both before and after the administration of nitrate of potash, contains the same quantity of fibrin.

These salts are considered to be highly useful in acute rheumatism. It has been supposed that they protect the valves of the heart, or restore them to their natural state when made incompetent by this disease. This supposition is founded on a misapprehension of the morbid processes which lead to valvular contraction and incompetency. It was imagined that these structural changes resulted from the deposition of fibrin from the blood on the surface of the valves, and that the subsequent contraction of this fibrin rendered these shrunken and inefficient. This explanation certainly does not hold good, for in acute rheumatism these changes in the valves are owing to lymph formed in their own substance. Occasionally, however, fibrin is deposited from the blood on thickened and roughened valves. Yet even this, as has been just pointed out, can neither be prevented nor removed by these salts.

But, while it must be admitted that these salts do not act in the way supposed, many high authorities consider that they mitigate and shorten an attack of rheumatism. The advocates of nitre administer it in large doses, very freely diluted in water, giving as much as half an ounce to an ounce of the salt in the course of the day. It may be given in lemonade or barley-water agreeably sweetened. Under its influence, it is said, the urine becomes very abundant, when the fever simultaneously declines, and the pains abate. At present there are no observations sufficiently exact to determine this point.

The same discrepancies of opinion prevail regarding the influence of the nitrates on acute inflammation.

Large doses produce pains in the stomach, with vomiting and diarrhœa, great weakness, faintings, loss of consciousness, and death. The same symptoms, in a minor degree, are witnessed when less immoderate quantities are used. The patient is made languid, disinclined to exert either body or mind, and the pulse is feeble and slow.

These salts readily pass from the body through the kidneys with the urine, and in their passage over the urinary organs may irritate and inflame them, and in large doses may even produce bloody urine.

Nitrate of potash has been recommended for incontinence of urine of children.

The nitrates appear to possess the power of increasing temporarily the water and urea of the urine; ultimately, however, these both fall below their natural amount; hence these salts are mere eliminators of these substances.

They enjoy with some a very high reputation as diuretics, and in some cases appear to be of considerable service.

Their diuretic action is well displayed in lumbago and chronic rheumatism, accompanied by scanty high-coloured urine, becoming turbid on cooling. Ten grains of the salt dissolved in water will, in most cases, soon increase the urine, and render it clear and limpid, when the rheumatic pains generally decline.

CHLORATE OF POTASH.

In many of its chemical properties this salt corresponds to the preceding group of nitrates; like them it is endowed with a high diffusion-power, but differs from them in its sparing solubility.

A solution of the chlorate has been used as a wash to foul ulcers, which it is said to clean and stimulate; but other remedies are to be preferred.

This salt appears to increase the flow of the saliva, and, according to Hutchinson and others, to produce ulceration of the mucous membrane of the mouth. It is largely used in various affections of the mouth, and is of signal service in mercurial and simple salivation, in ulcerative stomatitis and aphthæ. It is particularly useful in the ulceration of the edges of the gums where they touch the teeth. This ulceration is generally limited to one side of the mouth, but affects both the upper and lower jaws, also that part of the tongue and cheeks coming in contact with the ulcerated gums. Although not at all dangerous, it is often a very obstinate complaint, especially when it occurs in adults. Children are most prone to it. Its influence on this form of ulceration is almost magical. In one or two days the chlorate cleans the dirty-looking ulceration, and in a day or two more heals it. It is said to cure follicular and phagedenic ulceration like a charm.

Some assert that its action is simply local, and that all its good effects may be obtained by its topical application.

Chlorate of soda is more soluble than chlorate of potash, and is said to be equally serviceable.

It seems to produce but little effect on the stomach, unless taken in very considerable quantities, when, like the nitrates, it inflames the mucous membrane, and produces both vomiting and diarrhœa. It is not employed in diseases of the stomach.

It passes readily into the blood, owing to its high diffusion-power; but owing to its slight solubility, large quantities cannot be very quickly conveyed into this fluid.

As this salt easily loses it oxygen, it was supposed at one time that it might yield this up to the blood and tissues, and so promote oxidation, but careful observations have conclusively proved the erroneousness of this view, as the salt can be obtained unaltered from the urine. It has been recommended in facial neuralgia.

Its influence, if any, on the organs of the body is unknown.

ALUM.
DRIED ALUM.
ACETATE OF ALUMINA.

THESE salts act mainly as astringents, in virtue, it is supposed, of their capacity to unite with albumen, and coagulate it.

They produce no effect on the entire skin; but when applied to sores, they coagulate the albumen of the pus, mucus, or of the tissues themselves, thus coating the sore with an impermeable layer, and protecting it from the action of the air. Alum, like many other metals, may be used to form this protective coating. These remedies have, however, a further action than that just described; for, as just stated, they act as astringents by combining with the tissues, and condensing them. On the topical application of alum the bloodvessels may be contracted, and the supply of blood to a sore much lessened. By constringing the bloodvessels, and by condensing the tissues themselves, the members of this group will depress the vital actions of a sore, and so check the secretion of mucus or pus. For this purpose alum is applied dry, or in solution, to relaxed and abundantly secreting sores.

Other astringents in such cases generally succeed better.

Alum solutions may be applied to free-weeping eczematous surfaces, to check profuse discharge, and to bring the eruption into a condition suited for other remedies. Alum, like other astringents, is generally insufficient to heal the disease.

Owing to their capacity of condensing tissues and coagulating albumen, these substances may be used to control bleeding. Alum has the advantage of being almost always at hand in an emergency. It is used only in the milder forms of bleeding. When hæmorrhage is severe, other treatment is of course required.

But to check the bleeding of piles, leech-bites, or slight cuts, alum dusted on the affected part, first wiping it dry, or applied in pretty strong solution, is generally sufficient. Bleeding from the gums may be treated in the same way. It may be injected into the nose in epistaxis, or may be snuffed up as the dried powder.

Alum in strong solutions (six grains to the ounce) has been recommended in prolapsed anus or uterus. Alum, however, is not much used in either of these cases.

As a wash in vulvitis of children, few remedies can be compared to alum. It should be used in the strength of sixty grains to a pint of water. This solution must be frequently applied, by the help of a syringe, to the secreting surface, first washing away the pus with warm water. The lotion should be applied every hour or oftener, and a piece of lint soaked in it may be left between the parts. Although generally successful, this treatment not unfrequently fails to check this troublesome complaint, even when it cannot be traced to any irritation, as worms, constipation, or teething. The solution just recommended may sometimes prove too strong, increasing both the inflammation and discharge, when of course its strength must be reduced.

Similar solutions are useful in chronic otorrhœa, although alum is far inferior to glycerine of tannic acid.

Simple, and especially purulent, ophthalmia of children are very successfully treated by a solution of alum of the strength of eight grains to the ounce of water. The conjunctiva must be well washed with this every quarter or half-hour. The frequency of the application is the chief condition of its success; for simple water, as frequently applied, is a useful, although inferior, application.

Few substances are so useful as alum in certain diseases of the mouth. Thus in simple ulcerative stomatitis,—that form which, beginning at the edge of the gums close to the teeth, and never spreading far from this part, is often limited or most marked over one half of the jaw,—dried alum applied dry by the finger many times a day is amply sufficient of itself to heal the ulceration in a few days. It is not merely astringent; but, from its attraction for water (which it has lost by being heated), it is also slightly escharotic, and so gently stimulates the indolent tissues of the part.

Ulcers like these affect by mere contact, and produce ulceration in the neighbouring mucous membrane of the tongue or cheek, which may be equally treated with dried alum.

Aphthous ulcers, showing but little disposition to heal, or indeed tending to spread, may be touched a few times a day with dried alum with the best effect. Usually no such application is required, and chlorate of potash, and perhaps a purgative, are all that is required. Other forms of ulceration may be treated in the same way. Alum is recommended to be applied to the throat either dry or in solution, in simple or scarlatinal sore throat, in tonsillitis, and even diphtheria. Alum being now little used in any of these diseases, perhaps its good effects were exaggerated by its advocates.

It is asserted that ten grains of powdered alum placed dry on the tongue will sometimes terminate a paroxysm of asthma.

Gargles of alum are more useful in chronic inflammations of the throat, when the mucous membrane is relaxed and covered with a grey mucus, or with pus. In such conditions alum is highly useful, although the glycerine of tannin will in general be found a surer and less disagreeable application.

In chronic ozœna, solutions of alum (a drachm to the pint) are highly serviceable, and many cases speedily yield when treated in the manner now to be described:—

About a foot above the patient's head is a basin containing the solution, and in this one end of an elastic tube is placed. The solution is then sucked into the tube, when the free end is placed in one nostril, and the ala of the nose pressed on it, but without closing it. The fluid then runs from the vessel through the tube, which is converted into a syphon, up one nostril and down the other, washing most thoroughly all the membrane lining the nose. The head is bent a little forward, and the mouth must be kept open. If properly conducted, none of the solution escapes by the mouth, but the whole of it runs through the nose.

This application generally removes the disease very speedily; and even when it fails to eradicate the disease, it yet checks the discharge, and removes the highly offensive smell so often present. Some prefer acetate of alumina to simple alum, as more efficient in correcting the fetor. The application should be used twice a day, or oftener, if the fetor be not removed. If the fetor is very great, a weak solution of permanganate of potash or carbolic acid may be used. This fetor, depending on decomposing matters, can generally be prevented by irrigating the nose in the manner described. A wash of a solution of glycerine of tannin in water is often useful. A strong solution of alum is sometimes useful in pruritus vulvæ.

In the form of spray, ten grains of alum to the ounce, if water is used, for chronic coughs and hoarseness.

In the stomach, alum behaves as on the denuded skin, coagulating the albumen, and constringing the mucous membrane. By both of these processes it hinders digestion. It may be used in bleeding from the stomach, which it often checks. It is, however, inferior to other astringents; it sometimes controls vomiting, but of what character is not with certainty known.

Alum acts in the intestines in a similar way, checking secretion from the mucous membrane, and constipating by rendering the contents of the canal drier and more difficult of propulsion. In virtue of this property alum is sometimes used in both acute and chronic diarrhœa. It has proved useful in the diarrhœa of typhoid fever and of dysentery.

It is uncertain how far the members of this group pass down the intestinal canal without being decomposed and rendered inert; probably not far. Alum has been extolled by the highest authorities for its good effects in lead colic. It is said to remove the spasm, and so the pain, and at the same time to unload the bowels. All this it is stated to accomplish more speedily and certainly than other remedies. It is ordered to be given in considerable quantities, as much as ten grains every hour. The few trials the author has given this treatment have not been rewarded with success.

The long-continued administration of these substances produce loss of appetite, constipation, and at last chronic catarrh of the stomach and intestines. Large doses cause gastro-enteritis at once, with its usual symptoms.

In certain stages of whooping-cough alum is an excellent remedy. It is useful when the acute stage is over, and when there is no fever nor inflammation of the lungs, nor any irritation of the teeth. In fact, it is only useful in uncomplicated cases; but under these circumstances few remedies give more satisfactory results. It speedily reduces the violence and frequency of the paroxysms, often indeed the frequency is at once lessened one half, and the case is quickly conducted to a satisfactory end.

The troublesome vomiting so often met with in this disease is in many instances at once checked by the alum, while, at the same time, the appetite much improves—effects observed sometimes even before the cough is in any way controlled. When alum is administered in this disease, constipation rarely happens.

It is possible that the alum influences whooping-cough by its astringent action on the throat. It may be urged in support of this conjecture that other astringent substances, such as tannin, etc., are useful in this disease (see Tannin), even when the remedy is applied only to the throat, as when glycerine of tannin is so employed; and that alum acts best when mixed with some tenacious fluid, as gum, glycerine, or honey, by which the solution is made to hang for some time about the fauces.

The alum should be given in doses varying from two to six grains every three hours, or it may be given every hour in corresponding doses. The paroxysmal cough, which may continue a long time after whooping-cough, and other coughs having the same character, may be advantageously treated by alum.

How much of these substances is absorbed by the intestines, and conveyed into the blood, is unknown; but probably not a large quantity. The chief part escapes with the fæces, which are said to be made firmer, and to lose their odour.

Alum is employed as a remote astringent to check bleeding from the lungs, uterus, kidneys, etc., and to check profuse sweating and discharges. It is doubtful if alum exerts much influence in this respect. Alum injections, employed in the manner directed for the injection of carbonate of soda (see Potash Group), are very useful (one drachm to a pint) to check leucorrhœal discharges. The alum solution constringes the parts, and sometimes causes severe cramp-like pains in the belly. Such injections rarely fail, if properly applied.

PREPARATIONS OF IRON.

IRON is a constant and necessary constituent of the body, and must be regarded as an important food.

None of the preparations of this metal produce any change when applied to the skin; several of the soluble salts combine with albumen, on raw surfaces, sores, and mucous membranes, condensing the tissues, and constringing the bloodvessels. Independently of this astringent action they act at the same time, according to the strength of the application or the condition of the sore, as stimulants or irritants.

The organic salts are less astringent and stimulating than the inorganic; while, of the inorganic, the ferric salts possess these properties in a greater degree than the ferrous salts.

Several compounds of iron may be employed on account of the properties just mentioned; but when a stimulant is required, other metallic preparations are preferable. The sulphate, but especially the ferric chloride, solid or in solution, is employed to check hæmorrhage. The chloride is a powerful styptic, and readily controls the bleeding from small vessels. It has the disadvantage, however, of irritating the surface of wounds, and preventing their union by first intention. Perchloride of iron will probably be superseded by carbolic acid; for, properly employed, this substance does not prevent the immediate closure of a wound.

The soluble preparations have a metallic astringent taste, and act on the mucous membrane of the mouth as on the abraded skin.

Iron salts are never employed as topical agents in diseases of the mouth; and as they often discolour the teeth, especially when the breath contains sulphuretted hydrogen gas arising from carious teeth, etc., they are generally taken through a quill, glass tube, or reed. Salts of iron stain the tongue black.

The effects of these salts in the stomach differ according to their properties. Some are astringent, stimulating, and in large doses irritating to the mucous membrane, as the pernitrate, the perchloride, the iodide, and the sulphate, while the remaining preparations are with respect to this membrane almost inert. These differences modify their medicinal application. If the stomach is irritable, then bland preparations of iron must be chosen. It is often stated that chlorotic or anæmic patients with weak stomachs must be treated with bland unirritating preparations of iron. In some instances, no doubt, the astringent preparations are ill borne, but in most cases they produce far better results than the bland forms of iron. A pale, flabby, broad, and teeth-indented tongue indicates almost always the need of large doses of the astringent preparations of iron. Thirty drops of the tincture, or three or four grains of the sulphate, may be given three times a day. Weak anæmic girls, suffering from pain and vomiting after food, with perhaps tenderness of the skin at the epigastrium, are often most effectually treated by large quantities of the tincture of the perchloride.

The soluble preparations of iron combine with the albumen in the stomach, while the insoluble preparations are dissolved to a variable extent in the acids of the gastric juice. The reduced iron is pretty freely soluble in this acid, but gives off hydrogen gas, or, if the preparation is impure, and contains a sulphide, sulphuretted hydrogen, either gas causing eructations, and the latter a very disagreeable taste. The peroxide, if strongly heated, is soluble with great difficulty in the stomach; the more slightly heated forms should therefore be preferred. The carbonate and the magnetic oxide are more easily dissolved than the sesquioxide.

The metallic preparations and the proto-salts, after undergoing solution, become, either in the stomach or duodenum, converted into sesqui-salts, very likely by means of the oxygen of the air swallowed with the saliva.

The astringent preparations, as the perchloride, acetate, pernitrate, or sulphate, may be employed to check hæmorrhage from the stomach. These preparations, in proportion to their astringency, confine the bowels; but to this rule there are many exceptions. As they are changed into an insoluble and inert sulphide, shortly after quitting the stomach, their astringency must be exerted on the upper part of the small intestines.

The sulphate, acetate, perchloride, pernitrate, in common with other astringent metallic preparations, may be given in diarrhœa. The pernitrate, much praised in the chronic forms of this complaint, is probably for this purpose an efficient preparation.

Owing to the astringency of iron salts, it is a useful practice to combine with each dose some mild laxative, as a few grains to half a drachm of sulphate of magnesia, soda, or potash. Some consider that the laxative markedly promotes the absorption of the iron.

In their course along the intestines, the iron salts, as we have said, are changed into a sulphide of the metal, giving to the fæces a black and characteristic appearance. A very small quantity of an iron salt is sufficient to stain the motions deeply, and to keep them blackened for several days after the discontinuance of the medicine. Iron salts have no direct influence on the pancreatic or biliary secretions.

In the treatment of the small thread-worms infesting the rectum, the tincture of the sesquichloride of iron may be usefully employed as an injection, in the strength of half a drachm of the tincture to a pint of water. The iron coagulates the albumen of these animals, and so destroys them.

Now comes an interesting and important question,—How much iron is absorbed into the blood? Of the insoluble compounds, probably but little, as the quantity of acid in the stomach is not great.

Of the soluble preparations it is hard to say. As, after the administration of a soluble iron salt, the increase of the iron in the urine is very small, it has been concluded that very little passes into the blood. The fact that almost all the iron taken by the mouth may be re-obtained from the fæces, seemed to strengthen this view; but a wider knowledge concerning the elimination of metals from the body proves this reasoning to be inconclusive. Most metals probably, but certainly iron, are eliminated from the system through the intestines, and make their exit with the fæces; for when iron salts are injected into the blood, the whole of it almost is recoverable from the fæces. That much more is absorbed than is appropriated by the blood corpuscles, is shown by the coloration iron produces in all the albuminous secretions of the body; for the fluids bathing the various cavities become coloured reddish-brown.

While, in the treatment of anæmia, many medical men advocate the use of large doses of iron salts, others as strenuously maintain that all the good effects may be obtained from very small doses, and they instance the beneficial results which often follow the use of ferruginous waters. In many instances, no doubt, anæmia is curable by the employment of small quantities of iron, but it is likewise certain that beneficial results are obtained much more quickly by large quantities. Half-drachm doses of the tincture, or six to eight grains of the sulphate, may be given two or three times daily. The following pill, originally employed by Blaud, is strongly recommended by Niemeyer: Sulphate of iron, carbonate of potash, of each half an ounce; tragacanth, as much as is required to make ninety-six pills. Three of these are to be taken three times a day, an additional pill being taken daily. There is no doubt of the great efficacy of this pill; but the iron without the carbonate appears to answer as well. These large doses of iron, while neither upsetting the stomach, nor producing headache, cure anæmia with astonishing rapidity.

In anæmia iron salts possess important properties, besides their influence over the growth of the corpuscles. They act beneficially on the relaxed mucous membrane of the digestive canal, and probably in this way promote its functions. It is, moreover, highly probable that after its entrance into the blood, the iron exerts an influence beyond that of merely increasing the quantity of red corpuscles; and hence iron preparations are employed, not simply to promote the formation of the blood discs, but on account likewise of their beneficial influence on the tissues of the body. Iron, therefore, cannot be regarded merely as a food to the system; it is also an important curative agent. Where we desire to benefit tonically the mucous membrane of the digestive canal and the tissues, large quantities of the soluble astringent preparations should be administered.

The experience of physicians of the last generation was in accordance with these views, and so is that of many highly practical men of the present day. But on the introduction of the bland and almost tasteless preparations of iron, they were thought to be in every way superior to the astringent forms. Their comparative tastelessness is certainly in their favour; moreover, it was considered, mainly on speculative grounds, that the astringent preparations must disorder digestion in anæmic persons. These theoretical opinions still prevail, but the author believes them to be ill-founded, and that, in the class of patients described above, the astringent preparations are to be preferred, even in large doses; and that much of the good observed to follow their administration is due to their direct action on the mucous membrane of the stomach and intestines, and on the organs which stud them. It has been experimentally shown that sulphate of iron does not check the solvent action of the gastric juice, and experience justifies the conclusion that in weak anæmic people it does not lessen, but increases the formation of this secretion.

If the digestive mucous membrane is in an irritable state, then, as we have previously pointed out, the astringent iron preparations, in full doses, may do harm.

There are also individual peculiarities in respect of iron. The digestive organs of some patients are easily upset by it; in some it induces fulness and pain in the head; while others in apparently similar conditions take it not only without inconvenience, but with great benefit.

It is sometimes advisable to humour the stomach by changing the preparation of iron occasionally.

According to most authorities, the iron in the blood combines with albumen. Bernard thinks it exists in the blood as a protoxide. Under certain conditions iron increases the quantity of blood corpuscles, and so improves the nutrition of the body generally.

Iron salts are thus useful "in maladies attended with defect of the red corpuscles of the blood; as in anæmia, with or without irregularity of the uterine functions (chlorosis, amenorrhœa, dysmenorrhœa, and menorrhagia), and whether occurring spontaneously and without any obvious cause, or resulting from profuse discharges (hæmorrhages, fluxes, as leucorrhœa, etc.), from food defective in either quantity or quality, and from deficiency of light and pure air. In these cases the use of iron, conjoined with sufficient nourishing food, pure air, abundance of light, and, when necessary, the employment of purgatives, proves curative. But when the anæmia or hydræmia is dependent on organic diseases, as cancer, granular degeneration of the kidney, or morbis cordis, the use of iron can at best be palliative only.

"Also in some chronic affections of the nervous system great benefit is obtained by the use of iron. Chorea, in a large number of cases, may be relieved, and oftentimes cured, by chalybeates; though in general they are inferior to arsenic, which usually cures chorea much more speedily and certainly than they do. Cases, however, sometimes occur in which the chalybeates are preferable, as where anæmia co-exists. Epilepsy and hysteria are other nervous affections which are sometimes benefited by a course of iron, especially when they are attended with anæmia or uterine obstructions." (Pereira.)

In scrofula and rickets the long-continued use of iron proves highly beneficial.

In amenorrhœa iron-salts are commonly administered. Conjoined with this affection there is usually much anæmia, so that these remedies, by removing this condition, assist in restoring the uterine organs to their proper functions.

It must always be remembered that the anæmia is dependent, not on deficiency in the supply of iron, but on a scanty assimilation of it; hence its use must be conjoined with well-regulated hygienic circumstances, otherwise iron appears to do very little good.

In some cases of neuralgia, where no organic cause can be discovered, salts of iron are especially recommended where anæmia is present. Their action is very uncertain. The huge doses in which these salts, especially the sesquioxide, have been given are probably injurious, and exert no greater influence over the disease than smaller ones. Large doses of perchloride of iron are of great benefit in diphtheria. It is a good plan to use the solution rather than the tincture, and to give the medicine very frequently—every hour, or even oftener. Whether the effects on the throat depend on the topical action of the medicine, or are produced after its entrance into the blood, is uncertain. The solution is frequently painted on the throat; but it is necessary, however, to apply it very gently, lest by increasing the inflammation it does more harm than good. By this means the spread of the disease appears to be arrested, and, it is said, the strength of the patient maintained. The solution may be applied with the atomizer, so as to penetrate into the trachea and bronchial tubes. Large hourly doses of the perchloride have been found of great use in erysipelas. In the hands of some observers this treatment has altogether failed, which may possibly be accounted for by the long intervals between the doses. The frequent repetition of the medicine is one of the most necessary conditions of success.

In the so-called hysteria of middle-aged women, occurring especially at the cessation of the menses, they often experience much fluttering of the heart, a sensation of fulness of the head, with heat and weight on the vertex, frequent flushings of the face, and "hot and cold perspirations." This combination of symptoms is generally removed by considerable doses of the sesquichloride of iron, given three times a day. If the symptoms, without fluttering at the heart, are limited to the head and face, then other remedies are more successful (nux vomica, opium, belladonna).

The salts of iron sometimes excite considerable irritation of the bladder, with frequent desire to pass water, which may contain a considerable quantity of mucus. It may cause in children nocturnal incontinence of urine. Iron salts not unfrequently cure this troublesome complaint, even when it is not dependent on worms in the rectum, or other irritation. The astringent preparations of iron are employed to arrest hæmorrhages, as from the lungs and kidneys. For this purpose the acetate is the best preparation; and the following is stated to be a very effectual way to administer it:—Add sufficient of the salt to water to make it taste distinctly, but not disagreeably, and let the patient sip this constantly. By this means sufficient can be taken without exciting nausea or disgust; indeed, patients often like it.

The salts of iron appear to lessen profuse secretions, such as occur in chronic bronchitis and leucorrhœa. Dr. Graves gave the compound iron mixture, in doses of one or two fluid drachms, to check excessive bronchial secretion.

Where both iron and iodine are indicated, the iodide of iron may be used; for instance, in syphilis complicated with much anæmia. It is a question of much interest whether it is preferable to administer these two agents separately or combined, as the iodide of iron, and whether when combined they so continue in their course through the stomach and circulation, or whether the salt is decomposed. Viewing this question chemically, outside the body, it would seem that in the stomach or blood an iodide of sodium and albuminate of iron must be formed. But some observations made, I believe, by Bernard, throw much doubt on this conclusion; for it was found that if iodide of potassium and a salt of iron were injected into the blood, no iron appeared in the saliva; but if an iodide of iron was employed, then both iodine and iron were found in this secretion.

The iron of the effete red corpuscles probably escapes with the bile; and when iron salts are swallowed, this fluid contains an excess of the metal. This, therefore, is one way in which iron may be separated from the body.

Its further separation takes place by means of those membranes whose secretion is albuminous; and as iron, very probably, like most other metals, can exist in the body only as an albuminate, it has been conjectured that it can be separated only by the secretions containing albumen. The following facts and considerations favour this view:—

When iron is injected into the blood, in a short time much of it reappears on the surfaces yielding an albuminous secretion; as the mucous membrane of the intestines, of the bronchial tubes, of the gall-bladder, of the urinary bladder; and the serous membranes, as the pericardium, peritoneum, and pleura. A small quantity escapes with the urine; but whether excreted by the kidneys, or separated by the mucous membrane lining the urinary passages, is uncertain. Some maintain that it is separated by the mucous membrane, and, in support of this view, urge that when the iron of the urine is much increased, irritation of the mucous membrane always occurs, shown by the frequent desire to make water, and by the excess of mucus in the urine.

The tincture of the perchloride of iron, in the proportion of half a drachm to half a pint of water, with a drachm of laudanum, makes a capital injection for gonorrhœa or gleet. It often speedily checks the discharge, and generally eases the pain on micturition. Mr. C. C. Fuller, of Albany Street, finds the following injection, used three times a day, very useful:—Sulphate of iron, twelve grains; tincture of opium, half an ounce; water, eight ounces.

A useful form is the syrup of the phosphate of iron, if there are any indications for the employment of phosphoric acid. (See Phosphate of Lime.)

NITRATE OF BISMUTH.
CARBONATE OF BISMUTH.

THESE powders are commonly used as harmless cosmetics; in intertrigo, and sometimes in eczema, they are useful as dusting powder; but other remedies are to be preferred in eczema.

When applied to the broken or unbroken skin, these substances, being insoluble in any fluid they may meet with then, are not absorbed.

Trousseau employed equal parts of bismuth and Venetian calc in chronic non-syphilitic ozœna. After clearing the nasal passages by strongly blowing the nose, some of this powder is to be snuffed up. He, however, prefers mercurial powders. (See Mercury.)

Being insoluble, they are tasteless, but they sometimes occasion a disagreeable sensation of roughness, and sometimes they blacken the tongue. This rough taste may generally be obviated by administering the drug in milk.

Little is known at present of the changes these medicines undergo, nor of their effect on the stomach. Whether they are dissolved or not, or whether their efficacy depends on physical or chemical properties, are questions remaining yet unsolved.

In many diseases of the stomach these preparations, and the nitrate especially, are very valuable. They ease the pain of most affections of this organ, whether depending on organic or so-called functional disease. Therefore, in cancer, chronic ulcer, and chronic inflammation of the stomach, bismuth is often serviceable. It is especially useful in the chronic gastritis of drunkards. By subduing pain it checks vomiting, and enables the stomach to tolerate food. It is also useful in gastrodgnia and cramp of the stomach. In children, many forms of vomiting, and notably that depending on acute or chronic catarrh of the stomach, yield speedily to this remedy. The various forms of pyrosis, whether acid, alkaline, or neutral, are very amenable to this drug, although our limited knowledge concerning the causes of this symptom does not enable us to lay down precise rules respecting the kind of pyrosis which bismuth most benefits.

Acidity of the stomach Dr. Graves successfully treated with nitrate of bismuth, and experience confirms his recommendation. He generally mixed it with opium or morphia, and sometimes magnesia. Flatulent dyspepsia, in some of its forms, yields more or less to bismuth; for this annoying complaint it may be mixed with an equal quantity of vegetable charcoal.

These remedies prove useful in some forms of chronic diarrhœa. Their action is most conspicuous in checking the exhausting purging of phthisis. They succeed often when other remedies fail. It is necessary to give as much as half a drachm to a drachm of the nitrate several times a day. This large quantity, taken with milk, does not disturb the stomach. It subdues the most intractable diarrhœa, effecting often such an improvement in the general health, that patients, whose speedy death seemed inevitable, rally, and return to the ordinary duties of life.

Neither preparation is employed to act on the remote organs of the body.

A bismuth injection—containing bismuth, half an ounce; glycerine, half an ounce; water, three ounces—is extremely useful in gonorrhœa, especially in the chronic. The same injection sometimes proves serviceable in gleet.

The chief part, if not all the bismuth is evacuated with the fæces. Some may be absorbed, but the quantity which enters the blood is probably extremely small.

LEAD SALTS.

LEAD, when added to albuminous fluids, forms a precipitate composed of albuminate of lead. Like other metals, the soluble salts of this group, when applied to the abraded skin or to sores, or to mucous membranes, coat them with an impermeable covering, which shields wounds from the air. If a protecting covering is required, other metals are generally employed. Besides combining with the albumen of the secretion, any excess of the solution will combine with the tissues themselves, in which manner, probably, lead salts condense these structures, and constringe the bloodvessels. The soluble salts of lead are used as lotions to unhealthy and over-secreting sores, and to eczematous eruptions. In some forms of eczema lead lotions are very useful. When there is much inflammation, and when the surface is raw and weeps copiously, it allays inflammation, checks the discharge, and removes the itching, burning, and tingling, so often accompanying eczema. Two or three drachms of liquor plumbi in ten ounces of water is generally sufficient. A stronger lotion, consisting of two ounces of liquor plumbi, two ounces of glycerine, and four ounces of water, is sometimes more successful. If the inflammation is great and the weeping abundant, the rash must be constantly covered with rags soaked in the lotion. In some cases it is useful to apply a poultice at night and the lotion during the day. The stronger lotion is especially useful in diffused eczema, without weeping, but with excessive itching and tingling. The diseased skin should be sponged with the lotion several times a day. The lotion may be greatly assisted by the employment of a weak alkaline or a sulphur bath. The fluid oozing so abundantly in eczema being strongly alkaline, the property of these lotions to check this discharge may be owing to their weak alkaline reaction. The stronger lotion allays very effectually the itching of pityriasis. Lead lotions occasionally ease the itching of urticaria.

In pruritus pudendi a lead lotion is often of great service, especially when the mucous membrane is red and excoriated. A weak lotion fails sometimes where a strong one succeeds. It may be necessary even to use equal parts of liquor plumbi and glycerine, an application which may excite a little smarting, but this soon passes away. When pruritus pudendi depends on ascarides, hæmorrhoids, or a tumour in the urethral passage, it is obvious that these applications are useless.

A lotion of one part of liquor plumbi,* with one or two parts of glycerine, is useful in the milder forms of lupus. The lotion should be applied warm after the crusts have been entirely removed.

While lead salts have many properties in common with those of other metals, they are distinguished by their unirritating, soothing character, whence they are constantly used when an astringent and soothing application is desired. The soluble lead preparation may be used to check bleeding from small vessels; but other astringents are more effective.

Solutions of the acetate and diacetate may be employed as injections and washes in chronic otorrhœa and vulvitis of children. By virtue of their astringency they lessen the production of pus, and by their soothing qualities they ease pain. They are of most use when the acute stage has just subsided, the tissues remaining irritable and painful. In the later stages stronger astringents are to be preferred.

Plasters made of lead, on account of their bland, unirritating character, are in common use.

These plasters, and lead applications generally, are sometimes objectionable, owing to the black discoloration they produce from the formation of the black sulphide with the sulphuretted hydrogen gas produced by the decomposition of the discharges.

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* When liquor plumbi is mentioned, we refer to the strong solution.

Pain in the loins, due to weakness, is often relieved by a stout plaster. Burgundy pitch on leather is generally used, but is very liable to produce a crop of itching papules which may spread over the greater part of the body. Though somewhat less adhesive, lead plaster is free from this objection. Back pains, due to uterine disease or piles, may sometimes be relieved by plasters.

In ulceration and sloughing of the cornea, lead washes must be avoided, lest a white compound become deposited in the structures of the ulcer, leaving a permanent opacity.

Lead injections are sometimes employed in gonorrhœa, gleet, and leucorrhœa.

Lead may be absorbed by the skin in sufficient quantity to produce lead-poisoning, entering the blood probably as an albuminate, which is soluble in weak acids and alkalies. Lead-poisoning occurs only when the solutions are applied continuously to large raw surfaces; moreover, this occurrence is so rare as not to prohibit in any way the use of lead lotions.

The insoluble lead salts are tasteless; the soluble have a sweetish acid and astringent taste.

The soluble preparations are astringent to the mucous membrane of the mouth, and combine with the albuminous substances they meet with.

That portion of the soluble compounds of lead having escaped combination with albumen in the mouth, is converted into an albuminate in the stomach.

The soluble lead preparations are sometimes used in hæmatemesis, and have been much recommended to check pyrosis.

The albuminate of lead in the intestines is probably speedily decomposed, producing a sulphide of lead, an insoluble and inert compound. The soluble salts act powerfully as astringents of the intestines, and cause constipation. They control many forms of diarrhœa, even that dependent on disease of the lower part of the small or of the large intestine.

The effects of lead on the parts of the intestines distant from the stomach and duodenum must be manifested through the nervous system; and we know the intimate sympathy existing between the different parts of this canal.

In summer diarrhœa, a few grains of the acetate with a small dose of morphia is a sure and speedy remedy.

It has been recommended in cholera, especially in its early stages. In the purging from dysentery and typhoid fever, and from tubercular disease of the intestines, few remedies are so useful. The acetate should then be combined with opium.

Added to a starch injection, used to check various forms of diarrhœa, it will increase its efficacy. It may be applied for a similar purpose as a suppository.

In large doses the acetate acts as a weak irritant poison, but the symptoms it produces differ from those of other irritants chiefly by the presence of constipation instead of diarrhœa.

It is by no means common to meet with cases of acute poisoning with lead salts, and even the most soluble salts rarely cause death.

Acute poisoning by the acetate induces the following symptoms:—Dry burning sensation in the throat, thirst, vomiting. Colic (pain relieved by firm pressure). Tenderness of the abdomen, obstinate constipation. Dark slate-colour motions, from the presence of plumbic sulphide. Great prostration of strength. Cramps of the extremities. Cold sweats. Giddiness. Numbness and even paralysis of the lower limbs. Sometimes coma. The urine is scanty and high-coloured. In one case it is reported that in less than five hours the extensor muscles of the extremities became paralysed, and the flexors rigidly contracted. The subacetate is even more powerful than the acetate. The carbonate has no irritant action.

The treatment of acute poisoning is to promote vomiting by lukewarm drinks, to give sulphate of soda, or sulphate of magnesia, or fresh precipitated sulphide of iron; but this last is rarely at hand. The stomach-pump should be used, and milk, with white of egg, may be given with advantage.

If small, nay, even minute quantities are taken for a long time, chronic lead-poisoning is produced. On account of the various uses of lead compounds, this may occur in many ways. Oxide of lead is used to sweeten wines, the soluble salts are used as hair-dyes, and wafers are often coloured with red lead. The carbonate being the basis of all paints, it often occurs during their preparation, when the lead is ground down, that, unless great care is taken the finer particles are inhaled. Snuff was formerly adulterated with lead, and in this way sufficient might be taken into the system to produce chronic poisoning. Then, painters become poisoned by eating their meals with unwashed hands, and so introducing lead into the system. Again, it occasionally happens that drinking-water becomes contaminated with lead dissolved from the lining of the tanks. Certain conditions of the water hinder its solution of the lead. Thus, pure water, and waters containing carbonic acid, carbonate of lime, and sulphate of lime, act but little on lead. On the other hand, waters containing much oxygen, organic matters, nitrites, nitrates, and chlorides, act freely on lead. Carbonic acid is very protective of lead ; it crusts the metal with an insoluble covering of carbonate, and protects it from the further action of the water.

The quantity of lead sufficient to produce all or some of the symptoms of chronic lead-poisoning is very small ; even one-fortieth to one-fiftieth of a grain per gallon has proved poisonous. But there appears to be individual differences in respect to the action of lead, some persons being sooner affected by it than others. In some cases this difference can be explained, as will be mentioned shortly. Acetate of lead, in five-grain doses, may be given for weeks, or even months, without producing symptoms of lead-poisoning. This has been abundantly proved at the Brompton Hospital, where the acetate is largely employed to check the diarrhœa of consumption ; yet it is extremely rare, even after the medicine has been continued for months, to meet with any symptoms attributable to the lead.

The symptoms indicative of chronic lead-poisoning are briefly—Constipation and, it may be, impaired digestion. A sweetish taste is experienced. A blue line is soon observed at the edges of the gums, produced by the sulphuretted hydrogen developed from the tartar of the teeth penetrating the tissues of the gums, and, uniting with the lead, forming with it a black sulphide ; consequently the blue line is most marked in persons who do not clean their teeth. It is seen only at the edge of the gums, where they come in contact with the teeth. Where the teeth are absent, there is no blue line. It is first observed, and is always most marked, in the gums in the neighbourhood of the incisor teeth. This blue line is one of the earliest indications of the effect of lead, and is one of the slowest to disappear. Besides the foregoing symptoms, the nutrition is impaired, the skin becomes very sallow, and, sooner or later, severe colic, with obstinate constipation, and sometimes vomiting, sets in. Colic may occur without any premonitory signs. In lead-colic the abdominal walls are retracted, and very rigid. The pain is mostly eased, but is sometimes aggravated, by firm pressure.

Frequent cramps—often severe—occur in the calves, and sometimes in the uterus, penis, and scrotum. The patient may be much affected by pains about the joints, generally of the extremities, increased by movement or wet weather, and simulating very closely rheumatic pains.

Sometimes paralysis takes places, generally affecting the upper extremities and the extensors of the arm, with its supinators and pronators. The muscles of the ball of the thumb waste greatly, and in severer cases the deltoid and even the muscles of the neck and trunk are similarly affected. Indeed, in the worst cases general paralysis may occur, with wasting of the muscles of the whole body, even the voice becoming weak. The paralysis mostly affects motion only, but sometimes sensation also is lost. Epilepsy, delirium, convulsions, or coma may occur, and destroy the patient; but death from chronic lead-poisoning is uncommon.

The cramps are not confined to the muscles of the extremities. The intestines are also affected, sometimes almost throughout their length, but generally only a limited extent is involved. If the finger is passed up the rectum, the contraction can sometimes be felt in the lower part of the bowels. The bloodvessels are said to be subject to cramps, like other parts of the body.

How the lead produces these paralyses and spasms, whether by attacking the muscles, nerves, or bloodvessels, or all of them, is at present quite unknown.

The colic is generally dependent on constipation; for when this is removed, the colic very generally disappears.

The influence of lead on the urates in the blood is most singular. Dr. Garrod, in his remarkable discoveries concerning gout, has elucidated this subject, and shown the intimate connection existing between lead-poisoning and gout. In gout, as this philosophical observer has shown, the urates are retained in the blood, with probably an increased formation of them. In gout, especially during the acute attacks, scarcely any uric acid is to be found in the urine, while an abundant quantity can be detected in the blood. The urates dissolved in the blood manifest an especial affinity for particular structures, as the cartilages, and bursæ, and fibrous tissues, particularly those of certain parts. During the deposition of the urates in the joints, acute inflammation is excited, and this is gout.

Lead will check the separation of urates from the blood by the kidneys. It diminishes the uric acid of the urine, whilst augmenting greatly that of the blood, and thus we have the pathological condition which excites the gouty inflammation. Dr. Garrod has further shown,—and his experience is corroborated by all who have investigated this subject,—that gout very frequently occurs among lead-workers, and that gouty patients very often exhibit the characteristic blue line of lead on their gums.

It may be further added in confirmation of Dr. Garrod's discoveries, that if to gouty people who are free at the time from an acute attack, a salt of lead is administered, acute gout is developed, with its accompanying symptoms of severe pain and high fever. Dr. Garrod first pointed out this fact, and the author has repeatedly verified his observations.

These considerations afford an explanation, in part at least, of the good effects of iodide of potassium on gout, as this salt, as has already been shown, promotes the excretion of lead from the system.

Lead is used for a variety of purposes, but chiefly on account of its astringent action on the tissues of the body. Thus it is employed in profuse discharges of the mucous membrane, as from the lungs in bronchitis, in which disease it has been strongly recommended. It is also employed to check bleeding from the nose, lungs, kidneys, and uterus.

It has been conjectured that lead given in Bright's disease might check the escape of albumen from the blood, and so lessen the amount of it in the urine. George Lewald has published some experiments instituted with the view of testing this point. He does not mention the form of kidney disease his patients suffered from, but it was probably the pale, flabby, fatty kind. He observed at the same time the influence of the lead on the amount of urine voided. These experiments, too few, perhaps, to decide the question, showed that lead constantly diminished the albumen of the urine, but only to a very small amount, namely, to about nine or ten grains in the twenty-four hours. The diminution appeared to hold no relation to the quantity of lead administered. In his experiments the quantity of water was simultaneously increased on an average by 200 c.c. in the twenty-four hours. Here again the increase held no proportion to the quantity of lead employed.

Lead has been found in the lungs, kidneys, spleen, liver, and brain, but at present there is no proof of its possessing an especial affinity for these parts.

M. Paul has investigated the influence of lead-poisoning on the fœtus. He says that persons working in lead factories frequently abort; and that the father may cause abortion, even when the mother is not a lead-worker.

In 123 pregnancies, seventy-three children were born dead. Of these seventy-three, sixty-four were abortions, four premature births, and five born at the full time. Of the fifty born alive, twenty died in the first year, eight the second, seven the third; one later. Fourteen only reached the age of ten.

Our knowledge is scant concerning the elimination of lead. A little lead only passes off with the urine; its elimination is, however, increased by the administration of iodide of potassium.

It is a further question whether the metal is separated by the kidneys with the urine, or by the mucous membrane of the urinary tract. On theoretical grounds it is difficult to imagine how metals, existing in the body as albuminates, can be eliminated with a non-albuminous secretion; moreover, after the administration of lead, as after that of iron and other metals, an increased quantity of the metal is detected in the urine; an increased amount of mucous, with signs of irritation of the mucous membrane of the bladder, occurring simultaneously, even to the extent of inducing a catarrhal condition, whence it has been inferred that the metal is separated with the mucus secreted by the mucous membrane.

NITRATE OF SILVER.
OXIDE OF SILVER.

The soluble preparation of silver, if painted on the entire skin, colours it, first an opaque white, which gradually changes to brown and black. If the application is a strong one, vesication even is produced. Nitrate of silver is sometimes applied to warts and other excrescences as a caustic, but other applications are more successful.

Applied to the abraded skin or to sores, the soluble salts of silver form albuminates, and cover the surface with a thin coating which protects it from the irritation of the air. The nitrate of silver acts as a powerful excitant of the tissues, and destroys them, but only very superficially. It is very frequently employed to unhealthy and unclean ulcers, to induce healthier growth. It induces much smarting pain, which, however, soon passes away.

Like most other soluble metallic preparations, the nitrate causes condensation of the tissues as well as contraction of the blood-vessels, on which account it is used to stay hæmorrhage. Being liable, however, to excite much inflammation and pain, other blander astringents should first be tried. It is sometimes necessary to resort to the nitrate of silver to check the bleeding from leech-bites.

It has been asserted that if a surface, burnt or scalded, is painted over with nitrate of silver before vesication has been produced, both the blistering and pain are prevented.

The pitting of small-pox may be prevented if, as soon as formed, each vesicle is opened, and nitrate of silver is applied to the raw surface beneath. The good effects of this treatment are well illustrated in a case narrated by Dr. F. Bowen. The vesicles on one side of the face and neck he treated in the way described, but left those on the opposite side untouched. It was found on recovery that the untreated side was deeply scarred, while the opposite side remained smooth and scarless. Dr. Bowen has devoted much attention to this subject, and is of opinion that this method is superior to all others. Moreover, he states that it is easily carried out by a nurse. He punctures the vesicles with a fine needle dipped in a solution containing twenty grains of nitrate of silver to an ounce of water. The solution must be applied early, at the latest on the fourth or fifth day of the eruption. Mr. Higginbottom finds it unnecessary to puncture the vesicles. It is enough, he says, to paint the skin in the manner recommended by him in erysipelas. Inflammation is diminished, and suppuration prevented.

Bed-sores are best prevented by painting the threatened skin as soon as it becomes red, and before it is broken, with a solution of nitrate of silver (20 grains to an ounce). The redness disappears, the skin becomes hardened, and the bed-sore is prevented, unless, as in the case of paralysis, there is a great proneness to the formation of bed-sores.

That species of boil which, beginning first as a papule, maturates into a pustule, and inflames and extends till a large dead core is produced, may, it is said, be arrested in its early pustular stage by painting it over at its very commencement with a strong solution of nitrate of silver. The author has had no experience of this method; but of the influence of collodion on similar boils, to be mentioned in another place, he can speak with the greatest praise.

Herpes labialis and the vesication of shingles may be arrested if the patch of erythema is painted over with nitrate of silver before or as soon as the vesicles begin to form.

It is not uncommon to meet with patients annoyed with a patch of lichen, the size of the palm of the hand, affecting almost any part of the body. The irritation caused by this patch may be excessive, sufficient even to break the sleep, and injure the health. By painting the patch with the nitrous ether solution of silver every day, or second day, as the itching may require, it may generally be removed.

Limited patches of eczema may sometimes be treated with benefit in the same way. Nitrate of silver proves most serviceable when the weeping stage has passed.

Psoriasis of the tongue and mucous membrane of the mouth is often benefited by the occasional application of nitrate of silver or sulphate of copper. If it depends on syphilis, then mercurial applications are best. In the superficial kinds of lupus a weak solution of nitrate of silver, gradually strengthened, is stated to be useful.

Higginbottom very strongly recommends the local application of nitrate of silver in erysipelas. No agent, he says, is so safe or efficacious in subduing external inflammations; but he points out that the success of the treatment depends entirely on the manner of conducting it. He directs the skin to be well washed with soap and water, then with simple water; after which it is to be wiped quite dry. Next, a solution of four scruples of nitrate of silver in four drachms of water, is to be applied two or three times to the inflamed surface, extending two or three inches beyond. He prefers the brittle stick of nitrate of silver to the crystals.

The intolerable itching of pruritus pudendi will often yield to the application of nitrate of silver. A large camel-hair brush soaked in a solution containing two to five grains to the ounce, must be painted three or four times a day over the vulva, and be thrust up to the os uteri. A stronger solution used less frequently will not answer so well.

Pruritus cutaneus of the meatus auditorius, occurring without any eruption on the skin, should be treated by the application of a strong solution of nitrate of silver, carefully avoiding the membrana tympani. If the itching arises from undue dryness of the ear from deficient secretion of wax, almond oil or glycerine should be tried first.

When nitrate of silver in solution is used as an outward application, it is far better to dissolve it in nitrous ether. Such a solution forms a uniform layer over the surface, and, unlike one composed of water, does not run into drops, leaving the intermediate skin dry. This superiority of the nitrous-ether solution consists in its property of dissolving the fatty matters of the skin. This solution is not available for erysipelas, as nitrous ether will not dissolve the quantity of silver required. Solutions of nitrate of silver are used to blacken the hair of the head. The hair is first washed with the solution of nitrate of silver, and then a comb, dipped into a solution of sulphide of potassium, is passed through it; a process resulting in the production of a dull, shiningless, black-bluish colour.

The solid stick of nitrate of silver is sometimes passed over the edges of the eyelids, when affected with obstinate tinea tarsi. The eyelashes, with the scabs, should be first removed.

Solutions of nitrate of silver, of various strengths, are employed in conjunctivitis. A few drops, with the aid of a quill, are inserted into the eye several times a day. It excites in the membrane a healthier inflammation, which quickly heals.

The nitrate may be applied to ulcers of the mouth. The soluble salts have an astringent metallic taste.

Nitrate of silver is a useful application in the early stage of inflammation of the throat, when the inflammation is superficial, and there is only a little swelling. By the application of a strong solution, or of the solid stick of nitrate of silver, the inflammation may be much subdued or even extinguished.

In chronic sore throats, when the tissues are relaxed and covered with pus, solutions of the nitrate may be applied with benefit. The author, however, does not think they are in any way superior to strong astringent and unirritating applications. Even ulcers are best treated by the glycerine of tannin; but if in a sloughing and unhealthy condition, then the irritant nitrate of silver must be preferred. It is also applied with doubtful benefit as a local application in diphtheria. Most authorities are agreed that the application should be limited to the inflamed patches; for if applied beyond their area, it excites an extension of the inflammation, on which the false membrane may readily form.

Nitrate of silver, in powder or solution, is sometimes applied by means of a probang, brush, or sponge, to the chronically inflamed larynx, as in phthisis; or solutions of nitrate of silver, in the proportion of gr. $\frac{1}{2}$ to gr. v. to the ounce of water, may be brought to bear on the pharynx and larynx by the spray producer.

The violence and frequency of the paroxysm in whooping-cough are much diminished by sponging out the throat with a solution of nitrate of silver; with the effect of rendering the cough but half as frequent, and much less severe, so that a child harassed with broken sleep obtains a good night's rest. But there is a formidable drawback to this treatment; for the application generally produces so violent an attack of coughing, as to excite fears lest suffocation should ensue, a result most liable to occur with very young children. Instead of sponging the throat, the nitrate of silver may be applied in the form of spray by the atomizer. Very young children, however, cannot be induced to open their mouths, and allow the inhalation of the spray; hence the use of this application is restricted to children more than two or three years old. As either of these applications is liable to excite retching, they should be employed when the stomach is empty.

That part of the salt having escaped conversion in the mouth is changed into an albuminate when it enters the stomach. If sufficient albumen is not present to effect this, the salt attacks the mucous membrane, and excites in it an active inflammation. The best antidote is common salt for a poisonous dose, a fact it is well to bear in mind if, as sometimes happens in applying the solid stick of nitrate of silver to the throat, it breaks off and is swallowed.

Nitrate of silver acts as an irritant in the stomach, and may be used in precisely the same class of cases in which it has been recommended to use arsenic. It often checks the pain and vomiting of chronic inflammation, of chronic ulcer, and even of cancer, of this organ. It should not be given in the form of a pill, but as a solution.

The nitrate acts as an astringent in the intestines, and, in common with several other metallic preparations, may be used in diarrhœa, both of the acute and chronic kind.

These salts enter the blood, and probably collect in the red corpuscles as other metals tend to do, if not speedily deposited in the organs or separated by the secretions. After absorption these salts are supposed to be astringent to the tissues to which they are conveyed, but this is doubtful, and they are never used to check either bleeding or secretion from the distant organs of the body.

Both the oxide and nitrate are employed in chorea and epilepsy, apparently with occasional benefit. The oxide has been given to check profuse sweating. If administered too long, these substances, in some form, probably as the reduced metal, are deposited in the deeper parts of the skin. The deposition is most abundant where the skin is finest and most vascular. Once deposited, the metal remains as a permanent discoloration, and produces a deep leaden hue, which neither time nor treatment can remove. This discoloration does not occur till the medicine has been taken for some months. This metal appears to be chiefly eliminated by the intestines and bile, very little escaping by the urine.

The nitrate, in solutions of various strength, is used successfully as an injection in gonorrhœa. Some advocate a very strong solution (twenty grains to the ounce), averring that the disease may in many instances be at once cut short by it. Others prefer a much weaker solution of one or two grains to the ounce of water, repeating the injection several times a day.

The solid stick is sometimes applied to strictures of the urethra.

The author believes that a solution of glycerine of tannin, one half the strength of the pharmacopœial preparation, will be found a better injection for both gonorrhœa and gleet than nitrate of silver.

MERCURY AND ITS PREPARATIONS.

The salts of mercury possess very various physical as well as chemical properties; but as in every instance their effect on the system is well-nigh the same, probably all mercury compounds ultimately assume the same form in the blood.

The nitrates of the oxide and suboxide are escharotic; but much of this action is due to the free nitric acid of the salt. They may be used to remove warts, condylomata, and other slight excrescences. The annoying itching of some skin affections may be completely allayed by mercurial applications. Solutions of bichloride, black wash, yellow wash, or mercurial ointment, may each prove useful, but the application must be a strong one. Trousseau highly recommends the part to be bathed with a solution of about twelve grains of bichloride in a pint of very warm water. After much experience of these applications, the author believes that an ointment composed of a drachm of calomel to an ounce of lard will be found by far the best application.

But this, in common with other mercurial applications, is not useful in all kinds of itching of the skin; for instance, the irritation of urticaria remains unaffected by it.

Calomel ointment often removes the itching of pruritus ani immediately. This irritation may be due to rashes, as psoriasis, lichen, or eczema, or no eruption may be visible, yet the ointment will prove equally efficacious. Sometimes the itching is felt along the raphē leading from the anus to the scrotum, and may be due to little round spots looking like psoriasis, with the scales washed off. This form also yields to the ointment. Pruritus pudendi is less frequently eased by this application.*

The rashes themselves are in many instances improved by the ointment, but this is due, in some measure, to the cessation of the scratching on the disappearance of the itching.

Sometimes a little scabbiness of the head, looking like mild eczema, occurs in children, accompanied by a degree of itching sufficient to prevent sleep, and to cause constant restlessness. This irritation may be speedily appeased by the application of calomel ointment.

The distressing itching of the scalp, sometimes accompanying pityriasis, may be allayed by inunction with calomel ointment. It may be profitably added to other ointments used for the removal of pityriasis, as oxide of mercury or of tar. /to

It may be objected that so strong an application of mercury, especially when applied to soft and absorbing parts, as the inner surface of the vulva, and the skin around the anus, must surely produce salivation. No doubt care should be exercised, and no more ointment used than is needed. Yet the risk of salivation seems to be extremely slight; for with a very large experience of the ointment, the author has never seen salivation produced by it. Properly applied, a very small piece of ointment is generally sufficient to allay the irritation at once, and in a few days to even remove it altogether, although it is very apt, after a variable time, to return. In this event, relief may again be obtained by a renewed employment of the ointment. Its grateful effects are often almost instantaneous; but sometimes it takes a few days to give ease. Having many times seen it succeed when other remedies have entirely failed, the author is convinced of the value of this application in these troublesome diseases.

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* Blisters to the thighs, or the application of a few leeches, sometimes afford relief in obstinate cases of pruritus ani and pruritus pudendi.

The various kinds of lice infesting different parts of the body may be destroyed by white precipitate or nitrate of mercury ointment, or by corrosive-sublimate wash. For lice on the pubes it is necessary to apply the ointment or lotion to the scrotum, hair on the perinæum, and around the anus. These applications destroy both the animals and their nits. The nits can be dislodged by washing the hairs with spirits of wine, which dissolves the gluey matter so strongly attaching the nit to the hair. If the lice have produced much rash, it is recommended to cut off the hair. The body louse may be killed by the essential oils, as the oil of rosemary, or by powdered pyrethrum, or by an ointment of staphisagria. Through fear of inducing salivation, some prefer these to mercurial applications. If ordinary care is observed, this fear is groundless. The under linen should be boiled to destroy any hidden lice.

The irritant ointments of mercury are useful in that obstinate and disfiguring affection, tinea ciliaris. The eyelashes should be cut short, and the ointment, either of nitrate or oxide of mercury, applied night and morning, picking off the scabs before each dressing. Mr. Hutchinson asserts that the quickest cure is effected by their epilation. Should these stimulating applications fail, others more powerful should be tried, as nitrate of silver, or sulphate of copper, the last-named salt being preferable, on account of its giving less pain.

Bichloride of mercury, one of the best parasiticides, is useful in favus, tinea sycosis, tinea tonsurans, eczema marginatum, and pityriasis versicolor (chloasma). A lotion containing two grains of bichloride to an ounce of water is generally sufficiently strong. In favus and tinea sycosis and tinea tonsurans, the lotion should be applied after each epilation, and should be continued for some time after epilation is discontinued. This treatment is highly spoken of by McCall Anderson.

It is taught, on high authority, that paronychia may be much benefited by the application of mercury ointment, repeated for ten minutes every hour, applying poultices at other times.

Baths of corrosive sublimate and chloride of ammonium, in the proportion of half an ounce of sublimate to one ounce of the chloride, are sometimes useful in the treatment of obstinate syphilitic and non-syphilitic rashes.

Patches of obstinate lichen and psoriasis, especially of the hands, even when not syphilitic, will sometimes yield to mercury ointment when milder treatment fails. The calomel and nitrate of mercury ointment may be mixed, and to them tar ointment is sometimes added with benefit.

In the early stages of acne a composed lotion of corrosive sublimate, one part; alcohol, enough to dissolve it; water, 100 parts, is said to be of use. A tea-spoonful of this is to be added to a quarter of a pint of water, and the face is to be sponged with the lotion night and morning. The bichloride lotion, if used for some time, produces a "scaliness and hardness of the cuticle."

Goitre is successfully treated with an ointment of biniodide of mercury. It has been largely employed in India with remarkable success. Its action is aided by the effects of the sun's rays, to which the tumour is exposed after inunction. The ointment is prepared in the following way: Melt three pounds of lard or mutton suet, strain and clean; when nearly cool, add nine drachms of biniodide of mercury, finely triturated; work the mixture well in a mortar till no grains of red are visible, and keep it in pots, protected from the light. In India this ointment is applied to the swelling at sun-rise, by means of an ivory spatula, and is then well rubbed in for at least ten minutes. The patient then sits with the goitre held up to the sun as long as he can endure it. In six or eight hours there will probably be some pain from the blistering action of the application, although no pustules will have arisen. At about two o'clock in the afternoon a second application is made, and the ointment is rubbed in with a light hand. The ointment is then allowed to remain, and its absorption is completed about the third day. In ordinary cases one such course will cure the patient, but in bad cases it may be necessary in six or twelve months to repeat the treatment. In countries where the sun is less powerful the patient sits before a fierce fire; or the ointment may be rubbed over the swelling night and morning, afterwards covering it with oilskin. In a few days the full effect is produced, when a mild ointment like spermaceti is substituted (Stainthorpe).

Mercurial ointments are useful in erythematous lupus (Moriz Kohn). The author has witnessed great advantage result from the use of calomel ointment in scrofulous and tubercular lupus of children.

In tubercular lupus Nayler advises touching the summit of the tubercle with the solution of acid nitrate of mercury, repeating the application till the tubercles are reduced to the level of the skin, but not deeper, or a scar will result. Each application excites a good deal of inflammation and pain. The pain may be allayed by covering the spot with collodion. Nayler uses the mercurial vapour bath in general eczema.

Mercurial preparations, especially black-wash, are very useful applications to syphilitic sores. Thus mucous tubercles soon yield to black-wash. Those elevated indurations occurring at the anus of children, differing from mucous tubercles, being of much larger size, of irregular shape, often limited to one side, and very generally extending some way up the rectum, are likewise best treated by the local application of black-wash. This eruption, which may bleed and smart severely each time a motion is passed, often disappears but slowly under the influence of mercury administered by the mouth, and in spite of the mercury may continue increasing slightly for months; while, if kept constantly moist with black-wash, the friends may be assured of its removal in ten days or a fortnight. Other syphilitic sores are well treated locally by black-wash.

When black-wash cannot be conveniently applied, calomel or citrine ointment well rubbed in may be substituted.

Syphilitic condylomata may generally be removed by dusting them with calomel.

Cyanide of mercury in solution, in the proportion of ten or fifteen grains of the salt to an ounce of water, is useful as a local application to syphilitic rashes and sores, as those of the throat, tongue, anus, etc.

Mercurial applications prove very useful in syphilitic psoriasis. They should be mixed with other substances, as tar.

Mr. Lee strongly recommends mercurial fumigations in the treatment of syphilis. Calomel is to be preferred to other preparations of mercury, as, being undestroyed by heat or moisture, it gives constant results. Some employ a dry fumigation; others maintain that the therapeutic effects of mercury are increased by steam. This mode of administering mercury is considered the best and surest way of eradicating the disease. Moreover it affects the general health less deleteriously, disturbing neither the functions of the stomach nor the intestines. Ten to twenty grains of calomel may be employed in each fumigation. The fumigations often produce a good deal of weakness and prostration, so that in many cases they cannot be continued. There can be no doubt that many cases of syphilis, rebellious to other treatment, yield to these fumigations. Sometimes only a portion of the body affected with syphilitic rashes is subjected to calomel fumigations.

Mercurial applications, but especially the mercurial and calomel ointments, are sometimes rubbed into delicate parts of the skin, to obtain their absorption and their general influence on the system. This method of treating syphilis has the advantage of not disordering the digestive canal, but it has the disadvantage of uncleanliness.

Bichloride of mercury has been injected under the skin. This painful mode of treating syphilis is not likely to become general. It may be stated that in this way a much smaller quantity affects the system than when administered by the mouth.

At one time the pitting of smallpox was prevented by the application to the face of mercurial ointment or of mercurial plaster.

It is a question of interest, whether the mercury itself plays any part in arresting the maturation of the pustules, and whether other applications are not as good. Much has been advanced on both sides of this question, but the author thinks it has been shown that other safer remedies may be used, if not with equal benefit, yet with sufficiently good results as to render it desirable to employ them in preference to the mercurial compounds. For it is necessary, if possible, to avoid the use of the mercurial applications, as several instances of very severe salivation have followed their employment in smallpox.

It is probable that, if light and air are excluded, the eruption of smallpox cannot develop itself, and pitting is consequently prevented. The exclusion of air and light can be perfectly effected by collodion and india-rubber dissolved in chloroform. These or other means should therefore be employed in preference to mercury compounds. (*Vide* Nitrate of Silver.)

In non-syphilitic ozœna, Trousseau employs the following snuff-powders—White precipitate, four grains; sugar in fine powder, 232 grains; or red precipitate, four grains; sugar in fine powder, 232 grains. The nose is first cleared by blowing it strongly, and then a pinch of either of these powders is snuffed up a few times daily for a few days. Sometimes these powders produce a rather powerful irritating effect on the mucous membrane. They quickly remove the stench, and modify the state of the mucous membrane, but unfortunately do not cure this very intractable complaint, as after a variable time the discharge usually recurs.

In the syphilitic ozœna of children, mercurial ointments, as nitrate of mercury ointment, partially melted, applied twice a day after the nose has been well cleared, often arrests the secretion, removes the obstruction, and improves the condition of the mucous membrane. Mucous tubercles, syphilitic psoriasis, and syphilitic ulceration of the mouth, are much benefited by the application of the solution of cyanide of mercury, ten or fifteen grains to the ounce. It need be applied only once a day, but must be well rubbed in.

Mercurial medicines, if administered for some time, seriously affect the mucous membrane of the mouth and salivary glands. There is first noticed a disagreeable metallic taste; the gums become swollen and tender, of a dark-red colour around the teeth. The mucous membrane investing the incisor teeth is first affected, whence the inflammation spreads; the tongue swells, the breath is excessively fetid, the secretion from the buccal mucous membrane is augmented, and the saliva is increased in quantity even to the extent of one or two pints daily. At first the saliva is richer than natural in epithelium and solid constituents, but after a time becomes clearer, more watery, and contains fat and mucous corpuscles. The salivary glands become swollen and painful; at last the inflammation of the mouth reaches such a point, that ulceration sets in, and progresses till large portions of the gums and cheeks may be destroyed, the teeth becoming loose, and the bones of the jaw carious. Some are much more prone to become salivated than others; weak people are more easily affected than strong. Children are rarely salivated. Disease, too, influences the operation of mercury; for in inflammation it is often well borne, while in granular disease of the kidneys or scrofula, patients are very liable to become salivated. It is stated that salivation has occurred three hours after a dose of mercury, that it may last a few hours only, or endure for several years, and even disappear for a time and then return.

The influence of mercurial preparations on tonsilitis in certain conditions is most marked, owing probably to its absorption into the circulation. In quinsy or scarlatina, when the tonsils are so enlarged as almost to meet, and when the difficulty in swallowing is nearly insuperable, with even danger of suffocation, if at such a crisis a third of a grain of grey powder is taken every hour, the swelling in a few hours becomes much reduced, and the danger and distress are obviated; and even if an abscess has formed, its maturation and evacuation appear to be effected more quickly.

The same powder, administered in the same dose and frequency, is useful in mumps, speedily relieving the swelling and pain of this affection. Probably, as in the last case, the drug acts only after its absorption.

The soluble preparations of mercury combine with the albuminous matters in the mouth, and any portion left uncombined attacks the mucous membrane, and may excite in it acute inflammation.

In the stomach they act in a similar manner.

A form of vomiting not unfrequently occurs in very young children—generally only a few weeks old—which yields in many instances to grey powder or calomel, but especially the former. The chief and to a great extent characteristic feature of this vomiting is its suddenness and quickness. Immediately the milk is swallowed, it is forcibly expelled, curdled or uncurdled, apparently without any retching or effort on the part of the child. The milk shoots out of both mouth and nose. Diarrhœa may exist, but more generally there is constipation. This affection often proves both obstinate and dangerous, as all the food swallowed is rejected, till the child, reduced almost to a skeleton, dies actually of starvation. At the *post-mortem* it often happens, either that nothing is found to account for this untoward result, or the mucous membrane may be much softened, and in consistency and appearance like water arrowroot. This vomiting, which resists all other remedies, is in many instances quickly stayed by one-third of a grain of grey powder, repeated every two or three hours. A twelfth of a grain of calomel every two hours sometimes similarly succeeds.

The soluble preparations act as purgatives, increasing the secretion from the mucous lining and the contractions of the muscular coat of the intestines. Not all, however, are employed as purgatives; and when purgation is desired, our choice falls either on calomel or grey powder; either of these, being tasteless, are useful preparations for children.

The influence of mercury salts on the pancreatic and biliary secretion is still undecided. Seeing the influence of mercury on the salivary glands, some conceive it probable that it exerts a similar influence on the pancreas, a gland whose structure and secretion are very similar to those of the salivary glands.

Concerning the action of mercury on the secretion of bile, the most opposite statements have been made. It has been stated, from experiments on animals, that the secretion of bile in health is much diminished by mercury. In his report, as secretary of the Edinburgh Committee appointed to investigate this matter, Dr. Hughes Bennett arrives at somewhat the same conclusion. This report states: (1.) That neither blue pill, calomel, nor corrosive sublimate, affect the bile unless they purge or impair the health when the quantity of bile is diminished. (2.) That during an attack of dysentery, both the solid and fluid constituents of the bile are diminished. (3.) Purgation from any cause lessens the amount of bile and the proportion of its solid constituents.

Yet the experience of generations strongly supports the general conviction that in some diseases mercury does increase the bile. And it is not difficult to conceive that mercury may set aside some condition existing in disease hindering the formation of bile, and so act as a cholagogue; yet in health will check this secretion.

There is a form of diarrhœa common in children which is admirably treated by small doses of bichloride of mercury. The child's health is bad; the digestion is imperfect, generally with annoying flatulent distention; and three or four pale, clayey, pasty, stinking motions are passed in the day. For this condition a grain of bichloride dissolved in half a pint of water, and of this a tea-spoonful given each hour—or what proves still better, one-third of a grain of grey powder every hour or two hours—give to the stools, in one or two days, their natural biliousness and frequency, even when the complaint has existed some weeks.

There is another serious form of diarrhœa, either acute or chronic, common in children, which may be very effectually treated by the same weak bichloride of mercury solution. The characteristics of this form are very slimy stools, especially if mixed with blood, accompanied by pain and straining. The great indication is the slimy character of the motion, which this medicine will with certainty remove. It happens sometimes that the slime is very tenacious, and, being coloured with blood, is described by the mother as "lumps of flesh." This affection, as we have said, may be acute, or it may be chronic, and last for months; but in either case the bichloride cures with remarkable speed and certainty.

The dysentery, acute or chronic, of adults, if the stools are slimy and bloody, is relieved in a similar manner. A hundredth of a grain, given hourly, or every two hours, according to the severity of the case, is generally sufficient. It rarely fails to free the stools from blood and slime, although in some cases a diarrhœa of a different character may continue for a short time longer, requiring perhaps other treatment for its removal.

In infantile cholera, characterized by incessant sickness, with profuse and almost continuous diarrhœa, very offensive and copious motions, watery almost colourless, or of a dirty, muddy aspect, a sixth of a grain of grey powder given hourly is of great service. Under this treatment the vomiting generally soon ceases, and the diarrhœa soon afterwards. Infantile cholera is an extremely fatal disease; runs so rapid a course that in a very brief space a child is reduced to a deathlike aspect and dangerous condition. It is essential to check the diarrhœa as speedily as possible. A starch injection with a minute quantity of laudanum will assist the action of the grey powder, and should be employed in urgent cases.

Infants are not unfrequently the subjects of chronic diarrhœa, characterized by watery, very offensive, muddy-looking or green-coloured stools, often to the number of ten or twelve daily. This diarrhœa is generally to be restrained by grey powder, in doses of a sixth of a grain, given at first hourly, and then every two or three hours, according to the frequency of the stools. The occurrence of vomiting is an additional indication for this treatment. Although this medicine may check the diarrhœa and vomiting, yet if the disease has endured a long time, so considerable may be the injury inflicted on the mucous membrane of the stomach, that food can neither be digested nor absorbed, and the child gradually wastes away. The appearance of thrush in the mouth is an unfavourable sign, as it generally indicates profound damage to the mucous membrane of the digestive canal. So also it is always a bad sign in the chronic diarrhœa of children, when the stools change in character from time to time—now watery, at another time slimy, at another curdy, and at another green. It is much easier to cure a diarrhœa when the motions are always of a uniform character.

The chronic diarrhœa of adults, independently of serious organic change of the intestines, with watery, pale stools, often yields to 1-100th of a grain of corrosive sublimate every two or three hours. The same treatment answers sometimes in the diarrhœa of typhoid fever and phthisis.

All mercury compounds, with the exception of the sulphide, enter the blood, and are employed in a variety of diseases on account of their action on distant organs.

The prolonged and undue employment of mercury produces serious mischief. The body wastes, and the blood becomes much impoverished. "Mercurial fever" may be induced, sometimes accompanied by pustular or vesicular eruptions. In mercurial tremors, weakness in the upper extremities is first noticed, and the voluntary movements lack their usual precision. Soon, slight tremors occur, and gradually increase in severity and extent till the whole body becomes affected, the legs being attacked before the trunk. These tremors are easily excited; they cannot be controlled, and persist for some time. In severe cases, almost every part of the body is affected by severe spasmodic movements, so that respiration is spasmodic, and the sufferer may be unable to walk, talk, or masticate. Loss of memory, headache, delirium, and even convulsions, may occur. Salivation is sometimes absent; for the mode of poisoning greatly influences the effect of mercury, inhalation generally producing tremors, inunction producing salivation. Tremors, however, have been excited by inunction. Complete recovery generally takes place, provided the patient is removed from the influence of mercury before the disease has greatly advanced. The treatment of mercurial poison consists of the use of simple or sulphurous baths, and of iodide of potassium. The influence of iodide of potassium on mercury in the system has been spoken of elsewhere. (*Vide* Iodide of Potassium.)

Formerly mercury was indiscriminately administered for the cure of syphilis, in all its forms and stages. Given in enormous quantity, the constitutional effects sought to be produced were very serious. Further experience showed that this severe treatment was by no means necessary; nay, that it did more injury than good. The bad effects undoubtedly resulting from the too free administration of this drug have led many to discontinue its use in syphilis, and even to attribute to the pernicious influence of mercury many of the more serious diseases, as destruction of the bone, etc., formerly met with in syphilitic patients. It has even been denied that these graver lesions are ever produced by syphilis.

There is much to countenance these views; for it is singular how similar are the phenomena produced by mercury to those which result from syphilis. The author thinks it is fairly shown that the serious secondary and tertiary symptoms which are laid to the charge of mercury, can be produced undoubtedly both by syphilis and by mercury salts; so that, if these salts are given too freely, and for too long a time, or under improper circumstances, they inflict great harm by aggravating the diseases they were given to cure.

An influential school of the present day maintains that mercury is powerless over syphilis, and that its administration is simply harmful. There is, however, a larger and equally influential school who are as firmly convinced of the usefulness of mercury when judiciously employed.

The believers in the efficacy of mercury generally hold:

That it is good in both primary and secondary syphilis.

That it is of use only in the treatment of the hard chancre, and does harm in the soft.

That by the use of mercury the hard chancre is more speedily cured, and the secondary symptoms less liable to appear, and are milder in character.

That most forms of secondary syphilis yield quickly to mercury.

The congenital syphilis of children, in most of its forms, succumbs to mercury with singular rapidity.

While admitting the validity of these views, it is necessary to say that syphilitic patients may very often be completely cured without mercury, by mere general treatment to improve the health; and further, if the health is kept in good order, the secondary symptoms will very generally either not break out, or will be of a mild character. Cases of syphilis occur which are entirely uninfluenced by mercury, and can be cured only by a diligent attention to those hygienic circumstances which mend the general health.

Mercurial fumigations with steam often prove of great service, and cure some obstinate syphilitic rashes when other means fail.

The firmest believers in the efficacy of mercury in syphilis are unanimously agreed that it is not only undesirable, but pernicious, to give it in sufficient quantity to produce salivation; yet it appears that those preparations which salivate quickest manifest the greatest power over the disease, and hence the metallic and mercurious preparations, as grey powder and calomel, are preferred to the mercuric, as corrosive sublimate.

It is a common practice, and no doubt often successful, to take mercurial purges, generally in the form of blue pill, to prevent or mitigate an attack of sick headache. For further information of the employment of mercury in this troublesome affection, the reader is referred to the section on podophyllum.

Formerly it was thought that mercury salts were endowed with the power of controlling inflammation, and to this end they were constantly given even to salivation. Now, however, their use under such circumstances is much less general. Bichloride of mercury certainly appears to be of great use in iritis and inflammations of the deep-seated parts of the eye. It is probably of service in other inflammations, especially of the serous membranes, in which it appears to check the inflammation, and to promote the absorption of effused products.

Typhoid fever, according to very high authorities, among whom may be mentioned Dr. Parkes, may be most beneficially influenced by small doses of calomel. It is necessary to exhibit this medicine at the commencement of the disease; some think it useless after the ninth or tenth day. It is considered to lessen the height of the fever, to shorten its course, to make the intestinal derangement much milder, and to check the diarrhœa. Some push the medicine till the gums are slightly touched; but this practice, not only unnecessary, but harmful, should be carefully avoided.

There are some observations, in part made by Dr. Harley, which tend to show that corrosive sublimate is a "heart poison;" for the heart of an animal destroyed by corrosive sublimate soon ceases to contract after death; and the heart of a frog suspended in a solution of this salt ceases to beat much sooner than a heart suspended in pure water.

Mercury remains a long time in the body, and, it is stated, may accumulate in globules in the cancellous structures of bone.

Mercury salts are to some extent eliminated by the urine, but chiefly by the mucous membrane of the intestines, and with the bile.

PREPARATIONS OF COPPER.

Applied to the unbroken skin, the soluble salts of copper produce no visible effect. On sores they unite with the soluble albuminous substances, forming an insoluble albuminate, which coats the surface, and in an imperfect manner may take the place of the lost cuticle. The thin pellicle thus formed protects the delicate structures from the air, and the substances floating in it, and so promotes the healing process. Like many other metals, these salts condense the structures and constringe the blood-vessels, and so lessen the supply of blood to the part. They may even arrest hæmorrhage from the smaller vessels. They act as irritants to the delicate tissues, producing slight inflammation, with some smarting pain.

To arrest bleeding, and as an irritant to indolent sores, the sulphate is most employed, either in stick or solution, or as an ointment.

Indolent forms of impetigo, after resisting the more usual applications, will sometimes yield to sulphate of copper.

The solid sulphate may often be rubbed along the edges of the eyelids with conspicuous advantage, when affected with tinea tarsi. Before the application is made, the eyelashes should be closely cut off, and the scabs carefully removed. Indeed, in every case where slight stimulation is required, this salt may be used. Milder in its action than nitrate of silver, it excites much less pain.

The soluble salts combine in the mouth with the liquid albuminous substances of this cavity, and precipitate them more or less completely. If used in quantity more than sufficient to do this, the mucous membrane itself is attacked in a manner altogether similar to the abraded skin. These salts possess a metallic, styptic taste. The sulphate, in the solid form, may be applied with great advantage to the tongue when affected with either specific or simple psoriasis, or indolent sores. In ulcerative stomatitis it may be painted in solution over the edges of the gums when the ulcerated surfaces will generally quickly heal; on the whole, dried alum is to be preferred.

A weak solution of this salt painted over the mucous membrane will remove the white, curdy-looking coating of thrush, and prevent its renewal.

In the stomach the soluble salts behave in a similar manner as in the mouth, and if taken in large quantities act as powerful irritant poisons.

These salts are emetic; the sulphate, being speedy, and mostly effectual in its operation, is not unfrequently prescribed. It generally produces one copious evacuation, neither purging nor producing much nausea or prostration. It is supposed to exert an especial action on the larynx, hence it is sometimes given in croup, and when it is necessary to expel any obstructing substances from the glottis by the mechanical efforts of vomiting. A good way to give this salt as a vomit, is to administer it in small and frequently repeated doses.

In moderate doses these salts are astringent to the mucous membrane of the intestines. The sulphate, administered either by the mouth or by injection into the rectum, is often effectual in staying severe chronic or acute diarrhœa, whether depending on serious organic disease or not.

Copper salts, taken for a considerable time in small quantities, are said to give rise to a condition not unlike that produced by lead; for example, colic, with alternating constipation and diarrhœa; and it is even said paralysis of the upper extremities, undistinguishable from that of lead.

Salts of copper find their way into the blood, existing there probably as albuminates.

Copper salts have been given in cholera and epilepsy.

Solutions of the sulphate are employed in gonorrhœa, gleet, and leucorrhœa.

Copper is eliminated both by the urine and fæces.

PREPARATIONS OF ZINC.

THE members of this group are employed in a variety of ways as applications to the skin.

Their common action is astringent and irritant; but on account of their different degress of solubility, their varying affinity for water, and perhaps for the tissues, these properties are manifested in unequal degrees.

Of the zinc salts, the chloride and iodide, from their high diffusion-power and great affinity for water, are the most energetic. Yet even these remain almost inert on the skin, unless the cuticle is first removed, when they permeate the tissues, and destroy them for a considerable depth. On applying the chloride, a sensation of warmth is first experienced, which increases to a burning pain, lasting seven or eight hours, by which time the tissues are destroyed, and a white eschar is formed, which separates in from seven to twelve days. The chloride and iodide, as we have just said, have hitherto been regarded as the most energetic salts of this series, but recently Mr. Marshall, of University College, has shown by experiments that the nitrate penetrates deeper than the chloride, destroying the tissues to a greater depth. According to the same authority, it possesses the further advantange of producing less pain than the chloride. These three preparations, but especially the chloride, are employed to destroy nævi, warts, condylomata, the skin affected with lupus, and the tissue of syphilitic ulcers.

The sulphate having a lower diffusion-power, its action is much more superficial. In common with the other soluble salts of zinc, it forms an insoluble compound with albumen, and by virtue of its astringency condenses the tissues and contracts the blood-vessels. As a stimulant and astringent it lessens the secretion, and promotes healthier growth of ill-conditioned, free-secreting sores or eruptions. It is used in common with the chloride as an injection in gonorrhœa or gleet.

A useful injection for gonorrhœa is a grain of chloride of zinc dissolved in a pint of water. Some of this is to be injected every hour of the day. Rest, if possible, should be observed; but this is not indispensable to the success of the injection. If the frequent injection causes any pain in the testicles, they should be suspended in, and frequently fomented with, hot water; if notwithstanding the pain continues, and the swelling increases, the injection must be employed less often. If treated at its very beginning, this injection will often remove the disease in twenty-four to forty-eight hours.

It may be objected that a solution so weak as the one recommended is no better than simple water; to which it may be answered, simple water does not cure with anything like the same rapidity. Moreover, if some of this solution is taken into the mouth, and retained there a few seconds, it will produce a decided roughness of the mucous membrane. Now, if the solution is strong enough to affect the mucous membrane of the mouth, it can certainly influence, in at least an equal degree, a similar structure in the urethra.

The carbonate and oxide are insoluble, or but very slightly soluble, in the animal fluids; and as these salts possess no affinity for water, their action on the tissues is very weak. They are, however, slightly astringent, and are useful, on account of this property, in ointment, or in powder. The ointment of the oxide is used as a mild stimulating application in eczema and impetigo, when, inflammation having subsided, the raw surface is left in an indolent state, with very little disposition to heal. Both the oxide and carbonate are used as dusting powder, and are, perhaps, the best powders for this purpose; but, as a rule, greasy applications are preferable. In inflamed conjunctiva, a weak solution of the sulphate dropped into the eye several times a day is often very useful. The same salt is occasionally employed as a gargle in relaxed sore throat, and is sometimes added to alum injections for leucorrhœa.

The more soluble preparations possess a metallic, styptic taste. None are employed in diseases of the mouth. The chloride has been used to destroy the exposed painful pulp of decayed teeth.

The carbonate in large doses produces some nausea and vomiting; but a full dose of the sulphate acts much more speedily, is a safe emetic, producing little prostration or nausea, and generally empties the stomach in one complete evacuation. It is therefore the best emetic in cases of poisoning, being far preferable to ipecacuanha, whose action is slow and unsure. It may be employed as an emetic in bronchitis or croup; in bronchitis, to expel the mucus from the bronchial tubes; in croup, the false membrane from the larynx; but other emetics are mostly preferred. The sulphate may be employed as an emetic, or in doses short of the induction of vomiting, in painful affections of the stomach, dependent on chronic inflammation of the mucous membrane. No satisfactory explanation has yet been given of the action of zinc salts as emetics. They vomit even if mixed with albumen. Injected into the blood, the sulphate excites vomiting.

On account of its slight solubility, the oxide exerts but little action on the stomach, little being dissolved unless much acid is present in the stomach.

The chloride is a corrosive poison. The sulphate, on account of its astringency, may be employed, like most other metallic salts, in diarrhœa. Its action must take effect on the upper part of the canal, since the portion escaping absorption must be speedily converted into an inert sulphide. The stomach may become habituated to the ingestion of very large doses of the sulphate, to the extent even of forty grains thrice daily, without obvious bad results, or without inducing either nausea or vomiting, or apparently any alteration in the mucous membrane of the digestive canal. The prolonged employment of such doses is imprudent, as it has been shown that superficial ulceration of the stomach may be produced.

Zinc colic has been described. The symptoms included constipation, vomiting, prostration, with disagreeable taste in the mouth.

Zinc finds its way into the blood, and exists there probably as an albuminate.

The oxide and sulphate have been employed with advantage in epilepsy, chorea, and whooping-cough. In bromide of potassium we now possess a better remedy for epilepsy. Chorea may be controlled by zinc salts, although in most cases arsenic is a better remedy. In certain forms of hysteria zinc salts prove useful, especially in the shape of valerianate of zinc.

These substances are reputed to be antispasmodic. When they produce nausea, no doubt they indirectly act thus; but it is doubtful whether non-emetic doses are efficient antispasmodics.

The oxide in two-grain doses, given nightly, often controls profuse colliquative sweating. It is also said to check the profuse secretion from the bronchial mucous membrane in some forms of bronchitis.

Dr. Hammond recommends oxide of zinc, in two to five-grain doses, for nervous headache. Bismuth he also finds useful.

This metal does not become fixed in the body, nor does it produce chronic affections like lead or mercury. Zinc salts are eliminated from the body less rapidly than some other metals. They pass out of the system in small quantities only by the urine. It has been thus asserted that very little of the salts pass into the blood. This may be true; but the fact that the chief part may be re-obtained from the fæces is no proof of this statement, as zinc, like many other metals, is probably excreted by the mucous membrane of the intestines, and with the bile.

PREPARATIONS OF ANTIMONY.

Tartar emetic, in the form of ointment, excites in the skin a characteristic inflammation, at first papular, then vesicular, and lastly pustular. The rash thus runs the course of the eruption of small-pox, and in each stage simulates it very closely. Yet there are points of difference distinguishable to a practised eye. Like small-pox eruption, this rash often scars; moreover, the action of this ointment, being capricious and painful, renders it an unsuitable external application.

Tartar-emetic ointment has been used as a counter-irritant when it is desired to obtain a powerful action of some continuance; for instance, to the scalp in tubercular meningitis.

Chloride of antimony is a powerful escharotic, but it produces an ill-conditioned, slow-healing sore.

Tartar emetic being the most used member of this group, our remarks will apply to this preparation, except when the contrary is stated.

Antimony preparations are not used as topical applications to the mouth. After small medicinal doses there may be felt in the stomach a slight sensation of soreness—a sensation easily mistaken for hunger. If pushed yet further, the medicine produces increased secretion of mucus from the stomach and intestines to the extent of inducing numerous moist motions; and diarrhœa with colic may set in. The bronchial mucous membrane also yields an increased secretion, and probably the secretion of the whole mucous tract is augmented.

Antimony is never used as a purgative; in fact, opium is frequently given in combination with tartar emetic, expressly to prevent purgation. Large doses excite nausea and vomiting. As an emetic, tartarized antimony produces considerable depression, with much nausea; and the repeated vomiting it excites is accompanied by great straining. It is somewhat tardy in its action, and may require twenty minutes to half an hour before it operates. This tardy action disqualifies it as an emetic in cases of poisoning. Like all nauseating medicines, it produces weakness and prostration, but in a greater degree than most other emetics.

Tartar emetic was formerly employed to induce muscular weakness and the relaxation of spasm, and so to facilitate the reductions of dislocations and hernia, but in such cases it is now completely superseded by chloroform.

Trousseau taught that the action of this medicine was much influenced by food. With low diet it produces its constitutional effects, but with a full diet it excites vomiting and purging. Its action is further modified by the quantity of water with which it is administered: this being small in bulk, vomiting takes place; if large, diarrhœa is produced. It was further observed by Trousseau that certain substances modify the effects of antimony; for wine and acid fruits, both fresh and preserved, develop the emetic and purgative properties of the drug.

The soluble antimony compounds easily enter the blood, but the form they there assume is unknown. Possibly the oxide of the metal, either in the stomach, intestines, or blood, combines with albumen, forming an albuminate. Antimony compounds do not combine with albumen, except in acid solutions, when an insoluble compound is formed.

It has been experimentally proved that after the administration of tartar emetic the insensible perspiration, chiefly of the skin, is increased. Since at the stage of nausea all emetics increase the sweat, it is difficult at present to decide whether tartar emetic affects the perspiration in any other way. Tartar-emetic wine is commonly given in fevers as a diaphoretic.

It is convenient here to notice the influence tartar emetic exerts on the excretion of carbonic acid and urea. Under its influence these excrementitious substances are both eliminated in greatly increased quantity. Whether the medicine is to be considered a mere eliminator of these products, or whether it likewise increases their formation, the experiments are not sufficient to determine, as in no instance were they continued long enough to decide this question.

In common with other emetics, this remedy is sometimes given in large doses to produce profuse nausea and vomiting, and it is held by many eminent authorities, among whom Dr. Graves may be mentioned, that the strong impression thus made on the system will cut short acute specific fevers and inflammations. Graves held that in this way typhus might be summarily checked. The period for the exhibition of emetics, he states, is very short; for after the lapse of twenty-four or thirty-six hours from the occurrence of the rigor, they will not succeed in arresting the disease.

Many cases of ague may be cured by the impression emetics make on the system. The action of quinine may be aided by an emetic administered each morning, and cases which resist quinine often yield immediately to the united action of quinine and emetics. Ipecacuanha and other emetics should be preferred to antimony.

Given to a healthy person, antimony will not lower the temperature of the body, if one experiment may be accepted as sufficient to settle this point. The author gave to a strong young man tartar emetic in half-grain doses every ten minutes for nearly seven hours, inducing great nausea and vomiting, with profuse perspiration, but during the whole time the temperature remained remarkably constant, not varying more than 0·4 Fahr., an amount of variation frequently observed in health.

Of late years antimony has been much employed in acute pneumonia, and the general experience of the profession is strong in its favour. Discretion, however, must be used in adapting the dose to the strength of the patient, who, if weak, must take alcoholic stimulants in conjunction with the tartar emetic. In many cases of pneumonia, under its influence the pain in the side gives way, the expectoration from rusty changes to bronchitic, the pulse and breathing are reduced in frequency, and the further spread of the inflammation is checked.

Other kinds of acute inflammation may be similarly treated, although the good results are not so apparent as with pneumonia. It is necessary to give the tartar emetic at the very beginning of the disease, otherwise its power over it is much less marked. In inflammation, one-fourth to one-half grain may be given every two or three hours, or a lesser proportionate dose every hour.

Treated in this way, tonsillitis, pleurisy, orchitis, bronchitis, puerperal peritonitis, inflammation of the breast, whitlow, and other inflammatory affections, may be shortened and made milder. Antimony may also be employed with considerable success in chronic bronchitis, when the expectoration is copious, frothy, and difficult to expel.

In the following disease tartar emetic is invaluable.

Young children, six to twelve years old, on the slightest exposure to cold, are attacked with much wheezing and some difficulty of breathing, sometimes so urgent as to compel them to sit all night propped up with pillows. The expectoration may be pretty abundant, but children of this age do not generally expectorate. On listening to the chest, there is heard much sonorous and sibilant, with perhaps a little bubbling, rhonchus; but this last is often absent. The wheezing is audible for a considerable distance, and sometimes the noise is so great as to be heard many rooms off. Occasionally the cough is troublesome, and on each exposure to cold the voice may become hoarse, and the cough hollow and barking. Some children are thus afflicted whenever the weather is cold, even in summer, and may not be free the whole winter; with others the attack lasts only a few weeks or days.

This affection sometimes follows measles. It is compared by the mother to asthma, with which, if not identical, it is certainly allied.

The best way to prepare and administer the solution of this salt is to add a grain of it to half a pint of water; of this give a tea-spoonful every quarter of an hour for the first hour, afterwards hourly. If the wheezing comes on at night, it is sufficient to give the medicine only at this time. The good effects of the medicine are speedily evident; for the child is often greatly benefited on the first night of its employment.

So small a dose, it may be thought, must be inefficacious, but when first given it very generally produces vomiting once or twice in the day. As it is not necessary to produce sickness, the dose in this case must be still smaller.

There is, however, an affection somewhat similar to that just described, which it is necessary to discriminate, since it is unaffected by tartar emetic. It occurs in children a few months old, and consists of a loud rattling, which is obviously caused by mucus in the throat or larynx. There is no bronchitis, or, if it exists, this is a mere coincidence; nay, sometimes on the occurrence of bronchitis the complaint in question ceases for a time. It is brought on and aggravated by cold, and may last, with some fluctuations, many months. In some cases the rattling is worse in the day, but is usually worse at night.

The wheezing of children, and even of adults, following an ordinary attack of bronchitis, may often be speedily removed by the same treatment. The tartar emetic is generally insufficient to allay the cough accompanying the diseases just described.

Antimony acts as a depressant on the heart, weakening its contractions, and increasing their frequency. These results depend in part on the nausea it produces.

According to the recommendation of Graves, it may be usefully employed in typhus and other fevers, when there is much excitement and furious delirium, symptoms which may be very generally calmed by the exhibition of this drug. As wakefulness is generally present, being, indeed, the cause of the excitement and delirium, opium should be added to the antimony. The combined influence of these remedies calms the excitement, and induces refreshing sleep, out of which the patient wakes refreshed and free from delusions. Judiciously employed, these remedies may save an almost hopeless life. Each of these remedies appears to assist the action of the other. The relative doses must be determined by the circumstances of the case. In furious delirium the tartar emetic must be given in full, and the opium in small quantities; while if wakefulness is the chief symptom, the delirium being not very boisterous, the dose of tartar emetic must be reduced, and the opium increased.

Graves advises one-fourth to one-half of a grain of the salt every hour or two hours; when it produces bilious stools, it must be discontinued. This treatment is very useful in the delirium which usually sets in about the ninth or tenth day of typhus.

The mania and sleeplessness of delirium tremens will generally give way to the same treatment.

Puerperal mania may be treated in the same way, although probably bromide of potassium and chloral give better results.

Tartar emetic is sometimes useful in chorea, given to the extent of producing nausea and vomiting once or twice a day. Sulphate of zinc, too, is occasionally beneficial. Each of these remedies must be given in increasing doses, as the system appears soon to tolerate them. Other remedies, however, are more efficient.

Tartar emetic, in doses of 1-36th to 1-48th of a grain, three or four times a day, may be given with advantage in strumous ophthalmia. Sharp purgation at the commencement of the treatment is highly useful.

In acute poisoning by tartar emetic, violent and continuous vomiting occurs, accompanied with a diarrhœa of bilious and bloody stools. The common symptoms of gastro-enteritis, and sometimes of peritonitis, are present. The prostration is intense, and profound fainting is often repeated. The respirations and the pulse are said to be reduced in frequency as well as strength; others assert that the pulse is more frequent.

The *post-mortem* appearances are, inflammation of the stomach and intestines, but not often of the gullet. The peritoneum may be, and, according to Harley, the rectum often is, inflamed, and usually some inflammation of the lungs is observable, tending to make it probable that tartar emetic exerts an especial action on these organs.

Applied to a sore or to the broken skin, or injected into the veins, antimony still excites nausea and vomiting, thus manifesting an especial affinity for the stomach or nervous centres.

In the treatment of poisoning by tartar emetic, the vomiting should be promoted by warm demulcent drinks, while strong tea or coffee, tannin or decoction of oak bark, should be diligently administered.

The statements concerning the influence of antimony on the urine are conflicting. The probable effect of tartar emetic on this excretion is to lessen the amount of water and chloride of sodium, owing to increased perspiration. Urea is greatly increased, and apparently in proportion to the dose. The pigment and uric acid are also increased, but in a less degree.

The golden sulphuret increases all the constituents of the urine, especially the urea, and sulphuric acid (Parkes on Urine).

Antimony is separated chiefly by the kidneys, some, however, passes with the bile, and perhaps by the intestines. A portion is retained in the body.

PREPARATIONS OF ARSENIC.

SINCE all arsenic salts produce the same symptoms, it is probable that in the blood they ultimately assume the same form.

Dry arsenious acid produces no changes in the unbroken skin, but in wounds or sores it excites very active inflammation, sufficient, if the application is a strong one, to destroy the tissues for some depth. Arsenious acid has long been used to destroy warts, condylomata, cancerous growths, etc.

It may be applied pure, or mixed in variable quantities with some bland powder, as starch. At times this application has enjoyed a high reputation, whilst at other times it has fallen into almost complete disuse. It is said that some have fallen victims to this treatment, through the absorption of arsenic in sufficient quantity to destroy life. An untoward result like this can occur only when certain well-known precautions are disregarded. The absorption can be effectually prevented if sufficient arsenic is employed to excite active inflammation; for inflamed tissues lose the power of absorption more or less completely. Produce active inflammation, and the patient is safe; but if, through fear of poisoning, too weak an application is employed, it is the most efficacious way of doing what it is desired to avoid. Those experienced in the employment of arsenic recommend that if the tissues to be destroyed are extensive, the arsenic should be applied to a part only of the surface at a time. When employed to remove large growths like cancer, the skin being unbroken, incisions are first made, and into these the arsenical paste is laid. Deep-seated and active inflammation soon sets in, and the growth dies for a considerable depth. The whole tumour often sloughs away from the healthy tissues,—is enucleated, as it is said,—leaving a clean and healthy sore, which heals without trouble in fifteen to thirty days.

Lupus and other obstinate skin affections may be treated in the same way.

Arsenious acid and powdered acacia, of each an ounce, blended with five fluid drachms of water, form an arsenical mucilage much used by Dr. Marsden to remove epitheliomatous growths. Some of this arsenical mucilage is to be painted over the tumour night and morning, taking great care to limit its employment to the diseased tissues. Each application, covering not more than a square inch, is to be often repeated, and the separation of the sloughs aided by poulticing.

The following powder may also be used:—Fresh lime, half an ounce; yellow sulphide of arsenic, 20 grains; starch, 180 grains. This powder may be cautiously used as a depilatory. The arsenic should constitute one-fifth or one-sixth part of arsenical powder, so as to insure the excitation of sufficient inflammation to prevent poisonous absorption.

Arsenic has a sweetish taste. In moderate doses it apparently neither undergoes nor produces any changes in the mouth. It is employed as an escharotic by dentists to destroy the exposed sensitive pulp of decayed teeth, or to destroy the pulp before stopping the tooth. If used to remove pain, the arsenic may be mixed with opium. The pain at first is sometimes aggravated.

The vapour of arsenical cigarettes is drawn into the lungs to prevent and lessen attacks of asthma. Care of course must be exercised in their manufacture. Trousseau advised the smoking of cigarettes made of paper "saturated with a solution containing half a drachm or a drachm of arsenite of soda in three drachms of water. Such inhalations, we should suppose, might be mischievous, unless closely watched." (Stillé).

These cigarettes may be used in chronic phthisis.

Arsenic in medicinal doses may be employed with great advantage when the mouth or throat is attacked by sloughing, malignant sores, as cancrum oris, malignant sore throat, and the like. It is also useful in chronic coryza, especially that form in which the patient is, perhaps, every day, or even several times a day, subjected to an attack of persistent sneezing, accompanied by profuse running from the eyes and nose, and sometimes severe frontal headache. Each attack may last several hours, and the disease continue for years. A drop of the solution of arsenic administered three times a day will often greatly help the removal of this condition. (See Camphor.)

There is another more developed and severer form of this affection for which arsenic is invaluable. We not seldom find a patient prone to catch cold, who then becomes troubled with severe and repeated attacks of sneezing, accompanied with profuse clear nasal discharge and severe frontal headache. Each attack lasts a few days; but, owing to the great susceptibility to cold, it frequently recurs. It is generally worse in the morning. The patient is often forewarned of an approaching attack by the occurrence of severe itching of the ala of one or both nostrils. A simple irritant like dust may be sufficient to excite a paroxysm. Continuing in the form just described for some time, occasionally for years, the inflammation may extend from the nose along the throat to the lungs, producing sore throat; soon followed by much difficulty of breathing, great wheezing, and free expectoration. The lung affection may last for some weeks. After this severe form has been established, the lungs may become attacked without any preliminary affection of the nose or throat.

The changes which arsenical compounds undergo in the stomach are at present unknown. There is no proof that, like most other metals, it combines with albumen to form an albuminate. From the uniformity in the action of all soluble arsenical compounds, it is possible that either in the stomach or the blood they ultimately assume the same composition.

Metallic arsenic, like the oxide, is poisonous; it is probably first oxidized, and then becomes active. Pure sulphide of the metal is inert, but as it generally contains a not inconsiderable quantity of the oxide, this admixture renders it poisonous.

It has been maintained that the condition of the stomach controls the action of arsenic on the system; for example, if food is present, the medicine becomes absorbed by the lacteals, and through them mixed with the blood, while, if the stomach is empty, the arsenic is absorbed by the veins, and, passing into the liver, is separated with the bile.

In small medicinal doses arsenic excites a sensation of warmth at the epigastrium, and gives rise to a sensation of hunger. Indeed, many maintain that arsenic promotes digestion, while increasing appetite. Others as strenuously deny this statement. Arsenic in certain diseases of the stomach, as we shall see hereafter, by removing or lessening a morbid condition, will promote digestion and appetite.

Few remedies are more useful in many diseases of the stomach than arsenic. In the so-called irritative dyspepsia, where the tongue is furred, and its papillæ red and prominent, a drop of the solution of arsenic, taken shortly before food, will be found of great benefit. Administered in the same manner, it will with almost unfailing certainty arrest the distressing vomiting of drunkards. This usually occurs in the morning before breakfast, and is accompanied by great straining and distress; yet generally very little, and sometimes nothing, is ejected. In the latter case it is called dry vomiting. The vomited matters are generally intensely bitter and sour, and of a green colour. Besides arresting the vomiting, it improves the state of the stomach and often restores both appetite and digestion.

In chronic ulcer and cancer of the stomach, arsenic is valuable, by allaying pain and checking vomiting. The author has seen this metal give relief in chronic ulcer, when the more commonly used remedies had failed.

The influence of this medicine is not restricted to the conditions just described. It not uncommonly removes heartburn and other distressing sensations of the stomach.

Persons suffering from chronic vomiting, who after most meals reject their food without pain and with scarcely any nausea, the food simply regurgitating into the mouth, are much benefited by small doses of arsenic.

It has been recommended in the vomiting of cholera.

The solution of arsenic, given as above described, is always of service in that form of chronic dyspepsia and diarrhœa characterized by the following symptoms:—A sinking at the pit of the stomach, which is relieved by food; but immediately on taking it, nay, even while it is being eaten, there is an urgent desire to relieve the bowels, which may compel the patient to leave the table. The motions then are solid, or semi-solid, usually containing lumps of half-digested food. The disease appears to depend on excessive peristaltic action of the stomach and intestines, whereby the food, before it is digested, is driven from the stomach to the intestines, and thence expelled. This is a form of diarrhœa common with children eight to twelve years of age. It may last many months. By a few days' use of arsenic the interval between the meal and the evacuation becomes prolonged, and at the end of a week or ten days the disease gives way. The author always gives the medicine, in one or two-drop doses, shortly before each meal. (See Opium.) Arsenic will often be found of service in other chronic forms of diarrhœa, even when due to serious organic disease, as the bowel ulceration of phthisis, etc.

This remedy has been strongly recommended in cholera; especially in the later stages of the disease, when there is much collapse.

Arsenic enters the blood freely, but the changes this metal effects in it are unknown. It has been detected not only in this fluid but in most of the organs of the body.

The statements as to the effects of arsenic if taken for a prolonged period are strangely conflicting; yet, although the opposed statements cannot at present be reconciled, no doubt both are true.

Some animals, as the horse and sheep, can take considerable quantities of arsenic, not only without harm, but with apparent benefit.

It is now established beyond reasonable doubt that in some parts of lower Austria, as Styria, many of the inhabitants are accustomed to take considerable quantities of arsenic, sometimes as a condiment with their food. It is said to be often eaten with cheese. They usually begin with a small dose, once or twice a week, the quantity being gradually increased, until half a grain, or a grain, or even more, is taken at one time. This custom seems to induce no untoward symptoms. Arsenic is eaten for a twofold purpose. The women, and even the men, take it to give clearness to their complexion, and to improve their personal appearance; and it is said to effect these objects. The men more frequently use it to confer on them the power to undergo great exertion without fatigue. Under the influence of arsenic, they maintain that they can climb mountains and accomplish fatiguing tasks impossible to compass without it. The experience of most countries is opposed to the Styrian practice; for it is generally found that the long-sustained administration of arsenic fails to induce tolerance of the drug, but, on the contrary, most serious consequences are sure to follow. Even in the arsenic-eating countries the habit is not without risk; for it is a general opinion there that many persons fall victims to the habit. It has been attempted to reconcile the foregoing discrepancy by suggesting that the arsenic is taken in an insoluble form, is not absorbed at all, but passes out with the motions, leaving the system unaffected for either good or evil. This supposition has been effectually disposed of by Dr. Maclagan's investigations. Thus he witnessed the eating of the arsenic by a well-known arsenic eater, and afterwards collected his urine, from which he obtained a considerable quantity of the poison.

Ordinary experience, however, shows that the long-continued use of arsenic produces serious symptoms, evidenced first in the eyes and stomach. The eyelids become slightly œdematous, the lower before the upper; while usually at the same time, or soon after, slight conjunctivitis occurs with suffusion and smarting of the eyes, and sometimes dimness of sight. The mucous membrane of the nose, mouth, and throat may be reddened and inflamed, giving rise to thirst and dryness of the mouth and throat. The digestion becomes deranged in some persons much sooner than in others. The appetite fails, and at the pit of the stomach a sensation of weight or soreness is felt, aggravated each time on taking food or the arsenic. Sometimes the stomach is affected before the eyes. On the appearance of any of these symptoms the drug must be given in smaller quantities, or discontinued. The skin becomes dry and dirty-looking, and a slight "branniness" may be noticed, most marked where the skin is covered with clothes. Eczema or urticaria may arise, or perhaps vesication or mere desquamation with tenderness of the palms of the hands and soles of the feet. Pityriasis and lichen also are said to have been produced by arsenic. So also with aching pains in the head, swelling and inflammation of the joints. Sleep may be much broken, or disturbed by dreams. Still more serious symptoms arise. The voice becomes rough, and in some cases salivation has taken place. Ulcers may form in the mouth. Nausea, with vomiting and diarrhœa, set in, with slimy and bloody motions, voided with much straining and pain. The hair, and even the nails, sometimes fall off. Cough, with bloody expectoration, may occur. With these serious symptoms the patient wastes away, the skin becomes dry and hot, the pulse frequent, especially at night. Pains in the limbs, tremblings, and even paralysis, set in; till at last the memory fails, sensation is lost, and death soon follows. The susceptibility to arsenic varies; some being speedily affected by two-drop doses of the arsenical solution, while others can take without injury for a considerable time ten to twenty drops. Dr. McCall Anderson states that patients while taking arsenic are liable to bronchitis, and should therefore be cautioned against exposure to cold.

A large dose induces the symptoms of acute poisoning. The arsenic acts as an irritant to the whole digestive canal, exciting in its delicate mucous membrane very active inflammation. The symptoms to be expected from severe inflammation of this tract accordingly occur. But, strange to say, the symptoms following a large poisonous dose are not invariably the same. The symptoms arising from acute inflammation of the digestive canal are most common, and prove fatal in four or five days. But sometimes such symptoms are almost or entirely absent, and in place of running the usual course of arsenical poisoning, profound coma sets in, from which the patient never wakes, but dies in a few hours, the mucous membrane of the stomach and intestines being free from all inflammation. Sometimes the symptoms are very like those of English cholera. (Guy.)

Even when injected into the blood, or applied to a wound, it is well known arsenic produces its local effects on the digestive canal, being found in the intestines, thus showing that this is one outlet by which the poison is eliminated from the system. The effects on the stomach and intestines are said to be as severe when the metal is injected into the blood or absorbed by a wound, as when swallowed. This is perhaps hardly true. From the foregoing facts it is evident that arsenic manifests an especial affinity for the mucous membrane of the intestinal canal.

The *post-mortem* examination in acute poisoning by arsenic shows much inflammation of the stomach, often in patches, in which arsenic powder is visible imbedded in the thick viscid mucus. Harley maintains that the arsenical mischief is most marked at the cardiac end of the stomach. Not unfrequently spots of ecchymosis are seen, and less commonly ulcerations. Perforation is rare. The œsophagus and intestines may undergo inflammation, often most severe in the rectum. Occasionally the mouth, throat, and even windpipe and bladder, become inflamed. The curious fact has been mentioned, that notwithstanding the existence of symptoms of inflammation, yet sometimes no traces of it are apparent on a *post-mortem* examination. This absence of inflammation cannot be explained by want of time for the arsenic to act; for in cases ending in death yet more rapidly, severe structural changes are to be found. Death may occur in two hours. Ecchymosis is commonly met with under the lining of the cavities of the heart, and it is said that, like phosphorous, it produces extreme fatty degeneration of the liver, heart, kidneys, and other structures; such changes may be effected in a few hours. Ether and chloroform are said to produce similar effects.

Arsenic, in moderate doses, it is said, gives fulness and increased strength to the pulse. From Harley's observations it appears that after death the heart in animals poisoned with arsenic sooner ceases to beat, than if they were destroyed by mechanical means.

Some give arsenic in prostrating acute febrile diseases, with the effect, so they aver, of strengthening the pulse, moistening the skin, and invigorating the patient.

If we may trust the experience of the inhabitants of Steyermark, the effect of arsenic is to make them long-winded; for under its influence they maintain that they can climb heights and undergo great exertion without distress of breathing.

Arsenic has long been recommended, and is an excellent remedy, in spasmodic diseases of the lungs; it is often useful in asthma, whether dependent on emphysema or not.

Some emphysematous persons, on catching cold, are troubled with slight wheezing at the chest, difficulty of breathing, especially on exertion, or at night-time, and are obliged, in consequence, to be partially propped up in bed. In such cases arsenic often gives great relief. It appears to be of little service when there is very much bronchitis, or when the paroxysms of dyspnœa are very urgent. In this contingency, lobelia or belladonna are preferred. Arsenic is especially used in the foregoing cases, where the difficulty of breathing can be connected with the retrocession of a rash, as eczema. The wheezing, with oppressed breathing, which affects some children for months, and even years, is generally much relieved by arsenic.

Arsenic lessens the carbonic acid of respiration.

The beneficial influence of arsenic in certain skin diseases is universally recognised. This is most conspicuous in the scaly eruptions and in chronic eczema. Lepra almost always yields to it, and its efficacy over other forms of psoriasis is hardly less marked. Many cases it cures, others it improves, but a few it leaves unbenefited.

Hunt, who has had more experience of this remedy than perhaps any other person, lays down many excellent rules for guidance in its employment. He recommends small doses as capable of effecting all that is possible by arsenic, and discountenances the practice of gradually increasing the medicine. If toxical effects arise, he advises lessening the dose, but not the discontinuance of the arsenic.

Arsenic is hurtful during the inflammatory stages of eruptions.

Children above five years will bear a dose nearly as large as adults; it is curious that girls often require a larger dose than boys.

The largest dose ever required is five minims, repeated three times a day; but some practitioners give double or even treble this quantity. It should never be given on an empty stomach.

Arsenic, if mixed with the food, does not usually irritate the bowels. In the course of a few days or weeks it will produce an itching or smarting in the conjunctiva. This membrane will appear slightly inflamed, the lower eyelid becoming a little puffed or swollen at this point. The cutaneous disease will begin to decline, and the dose must be reduced to four minims.

If the conjunctiva continue much inflamed, the dose must be further reduced, but the conjunctiva should be kept affected throughout the whole course.

If the skin become more inflamed, the course must not be interrupted, but an occasional aperient must be exhibited.

The arsenical treatment must be continued for as many months after the final disappearance of the eruption as it has existed years before. The foregoing practical rules concerning the administration of arsenic are taken from Mr. Hunt.

These rules closely correspond to the advice given by Dr. Graves in his clinical lectures. With two statements made in this "code of regulations" the author's experience does not quite correspond.

The smarting of the eyes and swelling of the lower lid he has not found to occur so often as Mr. Hunt implies; nor does he find it necessary to induce these toxic symptoms to insure the beneficial influence of the remedy on the eruption.

The first influence of the medicine on psoriasis is to make it redder and more inflamed; in fact, to make it look worse than before. This fact, if not known, would lead to the suspension of the drug just when it commenced to do good; but the remedy being continued, the redness soon declines, the eruption heals in the centre, leaving in a short time only a slight redness.

Chronic eczema, although perhaps not so amenable to arsenic as psoriasis, is very generally benefited by it. It is best suited to the obstinate chronic forms. It sometimes removes the obstinate eczema which attacks the vulva, the verge of the anus, and the scrotum.

That troublesome disease, pemphigus, as Mr. Hutchinson has shown, may generally be cured by arsenic; and although after a variable interval the eruption is very liable to recur, it will again yield to a renewed recourse to the medicine.

Lichen and other obstinate skin affections are not unfrequently benefited by the same remedy.

Few, if any, remedies are so successful in chorea as arsenic. It is true that if there is much anæmia, iron is required; if fever or rheumatism, these must be subdued by appropriate treatment. But, in simple uncomplicated cases of chorea, arsenic is by far the best remedy. Its occasional non-success is sometimes owing to the undue smallness of the dose, and it not uncommonly happens that decided improvement begins simultaneously with a freer administration of the medicine. If the chorea has resisted smaller quantities, children may take four, five, or more minims of the solution.

Arsenic has been found serviceable in epilepsy and neuralgia. It not unfrequently cures the dull throbbing pain affecting one brow. With the exception of quina, no drug subdues intermittent fever like arsenic. Some who have had very large experience of this disease, count this remedy equal, if not superior, to bark. The large majority of observers, however, do not accredit such pre-eminent virtues to arsenic, maintaining that cinchona arrests the disease quicker and more certainly; and is to be especially preferred in those malignant forms which, unless at once arrested, speedily destroy life. From a concurrence of testimony, arsenic appears to be most useful in long-standing, especially quartan agues.

Arsenic has lately been extolled in phthisis (probably fibroid phthisis). It is stated to improve the appetite, increase assimilation, lessen expectoration and cough, and to promote the cicatrization of cavities.

Arsenic is often serviceable in rheumatoid arthritis and nodosity of the joints, but the indications for its employment are unknown. The pains of this troublesome affection are sometimes increased, sometimes benefited, by heat. Some cases are worse in summer, others in winter. Some are worse during the day, or at night. All these forms arsenic will sometimes cure; yet in cases apparently identical, in some it fails, in others it cures. Its effects are sometimes astonishing. Joints for a long time considerably enlarged and stiffened become reduced to their natural size, and are again made supple. Large doses must be given for a considerable time; for it must be borne in mind, that if improvement does not speedily ensue, it must not be concluded that the medicine will fail. Some consider it necessary to produce the toxic effect of arsenic; but it is certain that in many cases improvement results without pushing the remedy to this extent.

Dr. Simpson employed arsenic in that peculiar affection of the bowels, prevalent among women, characterized by the copious discharge of membranous shreds, accompanied by much emaciation, and a long train of neuralgic and other nervous symptoms. It occasionally co-exists with dymenorrhœa, the membranous shreds being discharged both from the bowels and uterus.

Like other metals, arsenic is retained a long time in the body. It is more quickly eliminated than some metals, as lead. Some maintain that arsenic is to be found in the bones as arseniate of lime. This statement is denied by others. It may be detected in the milk.

It is found in the blood chiefly with the red corpuscles. It is separated from the body by the urine, the stomach, and intestines, and, perhaps by the liver. After poisoning with arsenic, the metal is found in the liver in quantities larger than elsewhere. It may be that, like many other metals, it is separated from the body with the bile.

Its influence on the composition of the urine is unknown. Some experimenters assert that the urea is lessened, as is the carbonic acid separated by the lungs, whence they conclude that arsenic diminishes considerably tissue metamorphosis. Vogel observed hæmato-globulin in the urine of an individual poisoned with arseniuretted hydrogen.

Dr. Garrod maintains that arsenic acid is less irritating to the stomach than arsenious acid.

COLLODION.

Collodion is useful in many ways. It is sometimes applied to chapped hands and chapped nipples; but chapped hands and lips are better treated with glycerine of starch, arnica cerate, or two parts of eau de Cologne to one of glycerine. Chapped nipples are often difficult to heal, and if other treatment fail, as equal parts of sulphurous acid and glycerine, collodion may be employed.

Collodion is used to accurately adjust and bind together the edges of cuts and wounds, and to exclude air.

Collodion subdues inflammation, eases pain, and checks vesication, when painted over superficial erysipelas, slight burns, or patches of herpes before vesicles are developed. Unfortunately the collodion coating often cracks, and by admitting air ceases to be efficacious; hence collodion is inferior to a solution of nitrate of silver in water, or nitrous ether (*vide* p. 165).

Dr. Hare, we believe, first employed collodion for boils. There are many kinds of boils. The common form begins as a pimple or pustule, whence the inflammation spreads, producing a hard painful swelling, the centre of which dying forms a core. If collodion is applied at the papular or pustular stage, the development of the boil is often arrested. The swelling around the pustule subsides, and the boil is arrested in the pustular stage. Collodion appears to be useless if the pustule has burst. The matter must not be removed after the collodion application, or inflammation recommences, and the boil follows the usual course. It is desirable to apply fresh coatings of collodion over the old ones, allowing them to remain till the pustule has dried up, and the sore has healed. If much pus accumulate beneath this covering, causing considerable pain, the collodion should be incised under carbolic acid, and the pus allowed to escape. The subsequent treatment must be conducted on Lister's carbolic-acid plan. This treatment allays the great irritation often accompanying the early stages of boils. Dr. Hare prefers the contractile collodion, and attributes much of its success to the pressure it exerts. The author has succeeded with flexible collodion; perhaps the contractile would have answered still better.*

Collodion, solutions of gutta-percha, or india-rubber in chloroform, prevent the pitting of small-pox. The flexible variety of collodion is better than the contractile (*vide* p. 163).

A mixture of collodion and carbolic acid is useful in toothache due to an exposed and inflamed pulp. The preparation is made by melting in a test-tube some crystallized carbolic acid, then adding an equal quantity of collodion. A jelly is formed, some of which, on a small piece of cotton-wool, inserted into the hollow, painful tooth, at first aggravates the pain, which in a few seconds diminishes, and soon ceases.

It is stated that contractile collodion painted over the inflamed part will speedily relieve the pain of acute gout, although for a brief space the application increases this pain. Some mix iodine with the collodion.

Sir D. Corrigan treats the incontinence of childhood and youth by collodion. The prepuce is drawn forward by the left hand, and the little cap thus formed at its extremity is smeared over with collodion, which contracting, draws closely together the edges of the prepuce, and so prevents the exit of urine. A fortnight of this plan is sometimes sufficient for the cure. When it is needful to pass water, the little cap of collodion can be easily removed by the nail. This application causes no pain, and does not prevent sleep. On rising in the morning, the prepuce is found distended with urine. Sir D. Corrigan thinks that if collodion were painted over the orifice of the urethra, it would answer as well. The author has tried this application with girls without success, as it excites smarting, and induces them to pick off the collodion.

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* The spread of carbuncles may be prevented by tightly strapping them with strips of adhesive plaster applied concentrically from the border inwards, around and over the swelling.

A mixture of two parts of glycerine to a hundred parts of collodion, sets without contracting or dragging the skin.

COD-LIVER OIL.
ALMOND OIL.
POPPY OIL.
HEMP-SEED OIL.
LINSEED OIL.
COCOA-NUT OIL.
DUGONG OIL.
PALM OIL.
LARD.
SUET.
WAX, &c.

In one form or other fats are found abundantly in both the animal and vegetable kingdoms, showing their great importance in organic life.

Fats are necessary foods to the animal body, being heat-giving, plastic, and force-supplying. They contribute by their combustion mainly to the generation of the heat of the body. They are essential to tissue-formation, for without them growth and nutrition would be impossible, or at least very imperfectly performed.

Their combustion moreover supplies most of the force to be appropriated by the nitrogenous structures, and through them converted into muscular force, secretive force, nerve force, etc.

For the most part, all fats have the same physical properties, differing only in their melting point. They differ much, however, in their chemical nature, but after their entrance into blood they are probably converted into fats having much the same composition.

Oils and fats are used to lubricate and to supple the skin when it has lost its elasticity, and become dry, hard, and liable to crack; for instance, in many scaly diseases, as psoriasis and xeroderma. They should be employed in conjunction with warm baths.

Fats, moreover, are applied to the surface of the body to prevent irritation by such excreta as urine or fæces, or by acrid discharges as in eczema. When used for this protective purpose, some stimulating substance is generally added, as the oxide of zinc.

Simple oils are used to soften and facilitate the removal of scabs, as of impetigo, eczema, and favus. In favus, preparatory to epilation, poultices are likewise useful.

Oils are sometimes rubbed into the skin of the whole surface, with occasional success, to prevent the exhausting sweating accompanying exhausting diseases, as phthisis; but this process is inferior to that of sponging the skin with a weak acid wash, and to other means. It was a custom with the ancient Romans, during the decline, when warm baths were so much indulged in, to check the profuse sweating caused by this enervating habit, with inunctions of fats.

In some instances fats have been rubbed into the skin with a view to their absorption, so as to minister to the nutrition of the body.

Fats and oils are in general use as excipients for the application of various agents to the skin.

It has been asserted that if the body is rubbed over with fatty substances, a considerable fall in its temperature occurs; but the author found this statement to be incorrect in one instance in which he tested it.

If the hands and feet of patients suffering from scarlet fever or measles are rubbed with some firm fat, it removes the irksome sensation of heat and tightness produced by the rashes of these diseases.

Some practitioners treat scarlatina solely by inunctions. A bland fat or oil is well rubbed into the skin of the whole body twice or three times a day, and is allowed to remain. Dr. Budd, of Bristol, recommends inunction of oil towards the end of scarlatina. During convalescence the patient takes a bath at night, and, after being wiped quite dry, a bland oil, like almond oil, is rubbed over the whole body. This treatment is said to assist desquamation, and to prevent sequelæ; moreover by preventing the branny particles of the skin being carried about the room by currents of air, this method claims to lessen the risk of contagion.

Oils and fats are not used topically for diseases of the mouth, nor do fats undergo alteration in this cavity. They are almost as little affected in the stomach. If enclosed in albuminous walls, as in the form of cells, these being dissolved, the fat is set free. Although themselves not acted upon by the stomach, fats, however, act upon the other forms of food. They certainly promote the fermentation of sugar and starch; and it is generally accepted that fats, by assisting those chemical changes which constitute digestion, aid the conversion of the nitrogenous food. For example, the presence of fats assist the fermentation of milk, and promote the process of artificial digestion. This action of fats upon food has been demonstrated outside the body. In what way fats effect these changes, and whether they themselves are in any measure modified in constitution at the same time, are questions at present quite unsettled. The importance of this property of fats must be sufficiently apparent, and needs no further comment. In large quantities they hinder digestion, possibly by their decomposition and the formation of acids foreign to the stomach.

In the intestines these substances undergo a variety of changes; among others, they are absorbed both by the lacteals and veins, but how this is effected is still an undecided question.

They are emulsionised by the alkaline pancreatic juice, and it has been thought that this facilitates their absorption; but it is difficult to understand how mere division should assist their passage from the intestines to the blood; further, it is maintained that when the pancreatic duct is tied, animals remain as fat as before.

It has been surmised that fat may become saponified, and so pass through the walls of the intestines into the blood. A small part probably does pass in this form into the circulation; but as much unsaponified fat is visible in the epithelial cells covering the villi, and much can be extracted from the chyle, the chief part must become absorbed in another manner.

The passage of fats through the moist animal membranes forming the intestinal canal is probably justly ascribed to the action of the bile.

In support of this proposition it may be advanced :—

I. While fats rise scarcely at all in capillary tubes moistened with water, if they are moistened with bile the fats rise from twelve to fourteen times higher.

II. It has been experimentally proved, that while fats pass with extreme difficulty through moist animal membranes, if these are moistened with bile the fats pass readily.

Other corroborative reasons could be brought forward, but it is not necessary to adduce them here.

Fats, by the agency of the intestinal juice, pass, to a small extent, into the blood.

Chief part of the fat passes into the lacteals ; a little into the veins, this portion being conveyed to the liver, there to be converted into cholic acid ; or, at least, it is probable that the oleic acid undergoes this change. This acid, uniting with the soda set free when the hydrochloric acid of the gastric juice is poured into the intestines, forms a kind of soap, namely, the taurocholate and glycocholate of soda. These again find their way into the intestines, and after serving their destined purpose there, the base reunites with the acid of the gastric juices from which it had been separated.

The influence of fats on the secretion of bile varies according to circumstances. If taken on an empty stomach, fats lessen it ; if taken with or after food, they increase it.

As food greatly augments the flow of bile, we have here an indication, abundantly corroborated by experience, to give fats either with or soon after a meal.

The melting point of a fat must influence its absoption; for if this is above the temperature of the body, it must remain unabsorbed, unless dissolved in the more liquifiable fats.

The stomach tolerates animal far better than vegetable fats; moreover animal fats may be given in larger doses, and continued for a longer time; circumstances which, in some measure, explain the medicinal superiority of animal over vegetable fats.

There is a limit to the quantity of fats which can be absorbed by the body. At first but a small quantity is taken up, and it happens often that for some weeks after the administration of cod-liver oil some of it reappears in the motions. By custom, however, more and more of it becomes absorbed, till large quantities may be taken, and find an entrance into the circulation. If too much is administered, it is liable to decompose, and to form hurtful acids, exciting nausea, vomiting, colic, and diarrhœa. This limitation to the quantity absorbed, as well as the irritation caused by any excess remaining in the intestines, are sufficient reasons, to say nothing of economy, to make it very undesirable to give more fat than can be appropriated. By examining the motions day by day we can learn at any time if too much is administered. Too large a dose is both wasteful and harmful.

Catarrh of the intestines is unfavourable to the absorption of fat. Oils are sometimes given after a poisonous dose of corrosive substance, with a view of forming a protective covering to the mucous membrane; but it is impossible for oils to coat a membrane moistened with water.

Fat is speedily saponified in the lacteals and bloodvessels, and most of it in the bloodvessels appears to collect in the blood corpuscles, and may contribute to their formation, growth, etc.

Fats, as we have said, are heat-giving, plastic, and force-supplying. By their oxidation they, in common with other combustible substances, uphold the temperature of the body. This, though an important, is not their only or their most valuable function.

Fats, like phosphate of lime, are necessary both to growth and nutrition; for in the most vitally endowed organs, fats are found in excess, and abound wherever cell-growth progresses rapidly; and this applies to both health and disease, for much fat is found in rapidly growing cancer; it is found moreover associated with the more highly organised constituents. Thus the fat existing in pus is chiefly associated with the corpuscles, comparatively little being found in the serum. More fat is found in plastic than non-plastic formations. In fact, observations day by day demonstrate more and more the importance of fats as tissue-forming substances. Facts like these obviously bear on the application of the members of this group in disease; but to this subject we shall return shortly.

Recent observations tend to show that fats are force-yielding substances, and that the peculiar forces of the body are mainly derived from the fats we consume. But a short time ago it was considered that the forces of the body were derived from the combustion of the nitrogenous structures of the body; but many circumstances tell conclusively against this hypothesis.

1. After severe and prolonged exercise, the urea of the urine is scarcely increased; and as this substance is a measure of the consumption of nitrogenous materals, it follows that at such times but little of it is consumed.

2. Under exertion, enormous quantities of carbonic acid are exhaled from the lungs, pointing indubitably to the combustion of carbo-hydrates, or of fatty substances, the urea at the same time not being increased.

3. The combustion occurs chiefly, not in the blood, but in the muscles themselves; for when these are separated from the body, and made to contract under a bell-glass, they are found to yield during the time of their activity an enormous quantity of carbonic acid.

4. It has been found by experiment that great exertion and prolonged labour can be endured when only starchy and fatty foods are eaten, while at the same time the urea of the urine is but little increased.

Fats being necessary to growth, nutrition, and the due performance of the functions of the body, they are peculiarly suited to convalescents from acute general diseases, aiding considerably the restoration to complete health. Fats are also useful in many chronic affections. For example: On the subsidence of many acute inflammations, as of the kidneys, heart, or lungs, a more chronic, but not less fatal, condition may be left, the danger of this being in proportion to the health of the patient previous to the acute attack. If the health of the patient has been impoverished, or if he is the subject of tuberculosis, or of scrofula, many sequelæ are liable to occur. Middle-aged and old people, in whom nutrition is less active than in children, are more liable to chronic diseases after acute attacks. A like danger threatens children, if their previous health has been damaged by unhygienic conditions. The chronic malady depends on deficient nutrition, and as fats are peculiarly promoters of nutrition, they are especially useful in such chronic maladies.

The dependence of chronic affections on the state of general nutrition may be shown in another way. Persons are found to suffer from some slight local affection, which, while the health is good, troubles them but little; but as the weakest link of the chain is the first to yield, if the health becomes deranged, the local malady is immediately developed or aggravated. Thus many persons can measure the state of their general health by the condition of a local disease. Here, again, any circumstance or treatment restorative of the general health will reduce the local affection to its former unimportant state. In such a case there is often an indication for giving cod-liver oil.

Thus experience confirms the efficacy of cod-liver oil in many chronic inflammations, as of the heart, lungs, and kidneys, and in the sequelæ of the acute specific diseases, as the chronic discharge from the ears or nose so often left by scarlet fever or measles.

The chronic degenerative diseases of old age are benefited by the same remedy.

Cod-liver oil is of special service in scrofula, removing the various manifestations of this disease, as chronic discharge from the ears and nose, strumous ophthalmia, strumous disease of the bones, strumous abscesses, etc.

In the treatment of phthisis cod-liver oil stands pre-eminent. The term phthisis, however, includes several distinct diseases. For our purpose it is sufficient here to divide them into the febrile and the non-febrile varieties:—those forms in which there is preternatural heat of the body, and those in which the temperature is natural, or is raised only occasionally, and for a short time.

The existence of fever in the febrile forms is by no means an indication of the uselessness or harmfulness of cod-liver oil, for many patients in this condition derive considerable benefit from it. In this form of phthisis, as, indeed, in all cases, we must be guided, in the employment of this remedy, not only by the nature of the disease, but also by the state of the patient in other respects. If the digestion is good, cod-liver oil may generally be given with advantage; but if the stomach is irritable, then, by still further disordering it, cod-liver oil does harm.

In the chronic or non-febrile forms of phthisis, cod-liver oil is very generally well borne, and does great good; but, as with the more acute varieties, it sometimes upsets the stomach. It is very generally held that diarrhœa in phthisis is a decisive symptom against the employment of the oil. This is only partly true. Cod-liver oil, no doubt, sometimes increases the diarrhœa, but this often arises from an unduly large dose, or its too frequent administration; for it often happens that the diarrhœa is even controlled by cod-liver oil, if only a tea-spoonful is given at a dose, once or twice a day. In cases of phthisis with diarrhœa, it is a good plan to begin the cod-liver oil with caution, and then, if it suits, it may be given with greater freedom. An excellent method is to give a tea-spoonful the last thing at night, immediately before the patient lies down to go to sleep. In this way oil may often be borne without producing either nausea or diarrhœa, when previously one or both of these unwished-for consequences were occasioned by it.

As might be expected, the early forms of phthisis are most benefited by the use of oils.

It is said that phlegmatic people, with sallow skins and dark complexions, benefit more by cod-liver oil than those of a sanguine temperament, with florid complexions.

Cod-liver oil is often very serviceable in chronic rheumatism, rheumatoid arthritis, chronic gout, chronic skin affections, syphilitic or otherwise. It is also particularly useful in emphysema of the lungs and chronic bronchitis; in the former checking lung degeneration, in the latter controlling expectoration.

Many persons, especially the aged, complain of much sinking, or a feeling of "craving," at the epigastrium, relieved, but for a short time only, by food. This is sometimes connected with atonic dyspepsia, and sometimes is dependent on the general state of health. If the intestinal canal is not in an irritable condition, cod-liver oil will remove this sinking. Middle-aged people, suffering from that anomalous group of symptoms called hysteria, sometimes complain of the same symptom: this too may be removed by oil, while the other group of symptoms are often simultaneously relieved.

Giddiness in the aged, when not due to serious organic disease of the brain, but probably to atheromatous changes in its vessels, or to a weak heart, is often best treated by cod-liver oil and quinine.

Fats prove of especial use in the chronic diseases of children, arising from mal-nutrition. It is easy to restore the nutrition and growth of children to the healthy state, when the local malady will generally disappear.

The course of laryngismus stridulus, rickets, chorea, the middle and after stage of whooping-cough, and chronic coughs, are often rendered milder and briefer by the employment of cod-liver oil.

The obstinate constipation met with in children sometimes yields to cod-liver oil.

Cod-liver oil is of great value in the precarious condition about to be described. A child a few months old, by chronic diarrhœa of a few pale, stinking, pulpy motions daily, may be reduced almost to a skeleton. The skin becomes leathery and wrinkled. Its food is perhaps rejected. When brought to this dangerous pass, thrush breaks out. In conjunction with medicine for the diarrhœa or vomiting, give to the child a tea-spoonful or half a tea-spoonful of cod-liver oil nightly before he is put to sleep, afterwards gradually increasing the quantity and frequency, and it will neither increase the vomiting nor the diarrhœa, but will promote its nourishment and growth, and greatly improve the general health.

Hitherto fats have been spoken of, for the most part, in common, but they certainly are not all equally useful in disease.

Animal fats, as we have seen, are to be preferred to vegetable fats; and liver fats are generally considered superior to all others. Whether cod-liver oil is superior to that of the livers of other animals, is difficult to decide, as the cod-liver oil of commerce is derived, no doubt, not only from the livers of various fish, but likewise, it is said, from those of other marine animals.

The superiority of liver oils has been thought to depend on the iodine, the phosphorus, or the bile they contain, each of these substances being present in very minute quantities. This conjecture is clearly wrong; and further, the effect of these substances on disease is dissimilar to that of cod-liver oil.

The superiority of liver oils is ascribable to their easy toleration by the stomach. They can generally be taken without inconvenience for months or years, while other fats and oils often produce nausea, loss of appetite, and diarrhœa. Moreover, there is reason to think that cod-liver oil is more easily absorbed than other oils.

Cod-liver oil, when first taken, often excites nausea, vomiting, and disagreeable eructations; occasionally the difficulty in overcoming the distaste for this medicine is almost insuperable. In most cases, however, this disgust is overcome, and in a short time the oil is taken even with relish. Indeed, children often come to look on the oil as a treat. Yet it sometimes happens that a child becomes languid, appetiteless, and appears worse; but this should not always discourage us, for usually after a week or ten days the oil is tolerated, and improvement begins.

The nausea and vomiting which this remedy often at first excites, not uncommonly arises from the undue largeness of the dose. At first the dose should be a tea-spoonful only, or even less, and if the stomach manifests any intolerance of it, one dose only should be given daily. If still there is great difficulty in retaining the oil, it is a good practice to take it at night-time, immediately before lying down to sleep.

Cod-liver oil is often administered in quantity so large, that it can scarcely be borne even when the stomach is accustomed to it. Weeks, and even months, may elapse before much oil can be digested and absorbed; hence, if swallowed in undue bulk, it merely passes off by the motions, and by its decomposition is liable to disorder the intestines. An examination of the motions shows whether the oil is given in unnecessarily large quantities.

Cod-liver oil may be taken after food on orange wine or weak brandy and water. It should be so poured upon either, as not to touch the glass, but to float on the surface as a globule, then tossed off, and some agreeable food or condiment will completely remove the taste. A little salt taken immediately before and after the oil often removes the taste, and prevents nausea. It is said that a few drops of ketchup added to the oil will cover its taste.

A mixture composed of equal parts of cod-liver oil, fresh mucilage of gum acacia, and water, has very little taste. The addition of two minims of oil of lemons to each ounce of this mixture, conceals effectually the cod-liver oil flavour.

A cod-liver oil jelly has recently been prepared, containing 70 per cent. of oil. Bolted like jelly, it is almost tasteless.

Notwithstanding these ingenious devices, it is not uncommon to meet with patients unable, even after repeated trials, to tolerate the oil, on account of the resulting eructations, loss of appetite, nausea, or vomiting. In some cases this intolerance is due to dyspepsia; but it is generally owing to that inability to digest and absorb fat so commonly noticed in consumption, and even before its development. This fact has been much dwelt on by Dr. Balthazar Foster, of Birmingham, who, from some experiments of Claude Bernard's, has been led to use ether as a means of assisting the digestion and absorption of fat.

Claude Bernard has shown that the action of ether "is twofold—(1) it stimulates the pancreas and glands of the duodenum to pour out their secretions freely,* and (2) at the same time it facilitates the absorption of those very substances which these secretions are designed to digest. In other words, ether not only obtains for us the secretions required to digest," but promotes the absorption of these fats when digested. These discoveries led Dr. Foster to give ether to patients intolerant of oil. After a prolonged investigation of the influence of ether, he finds that oils and fats are by its aid retained and digested which otherwise caused nausea and sickness, and that the combination increased appetite, nutrition, and weight. Dr. Foster employs ether purus of the Pharmacopœia in doses of ten to fifteen minims to every two drachms of oil. The ether may be given either separately or with the oil; but as the ether masks the unsavouriness of the oil, he generally combines them.

Lime-water mixed with the oil sometimes obviates nausea, and even diarrhœa.

Fats are consumed in the body, but sometimes a small quantity escapes with the fæces and urine. The quantity escaping by the urine is, however, insignificant, except in the disease called chylous urine, when fat is often present in considerable quantities. A little fat is voided in Bright's disease, with the uriniferous casts in the urine.

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* Bernard maintains that fats are chiefly absorbed by means of these secretions.

CASTOR OIL.
CROTON OIL.

These oils consist of a bland oil with a variable quantity of an acrid irritating purgative matter. This acrid irritating principle imparts to these oils their characteristic properties. It is increased by alkalies, and occurs in small quantities in castor oil and in large quantities in croton oil. It enables croton oil to irritate the skin, producing redness, vesication, and, after a strong application, even pustulation, followed by scars. Liquor potassæ is sometimes added to croton oil to heighten its irritant effects. Croton-oil liniment is highly esteemed as a counter-irritant by many persons who apply it to the chest of phthisical and bronchitic patients, even if children. Owing to the vesication it produces, this application cannot be repeated on more than one or two successive days, sometimes but one application can be borne. Croton-oil liniment is preferred by some persons to mustard poultices, in bronchitis and phthisis, and certainly some patients assert that croton oil gives them greater relief than mustard poultices. The vesication, however, is a decided disadvantage on the side of croton oil. After the employment of croton oil, the patient must carefully avoid conveying any of the application to tender parts of the skin, lest troublesome or severe inflammation be excited in the face or scrotum. Dr. Tilbury Fox states that croton oil not uncommonly produces a symmetrical erythema of the face, lasting for a few days, where no direct application of the remedy could have occurred. The author has seen this erythema of the face occur during the employment of croton oil; it is difficult to decide whether it depends on the action of the croton oil after its absorption into the blood, or on the volatile acrid principle reaching the face through the air, or by means of the hands.

Pure castor oil is almost tasteless. Croton oil possesses an acrid burning taste. Neither remedy is used for its topical effect on diseases of the mouth.

For the most part, these oils behave in the stomach and intestines like other oils. Large doses of croton oil inflame the stomach. If not quickly expelled from the intestines, they become absorbed into the blood, and serve the same purposes as other oils.

The acrid matter of these oils, irritating the mucous membrane of the intestine, excites slight catarrh, and by this means purges. As alkalies develop the acrid principle, the purgative action of these oils is heightened on their admixture with the alkali of the bile.

These oils, especially castor oil, are commonly used as purgatives. Castor oil is a speedy, certain, and mild purgative, producing only one, two, or three motions, with little griping. It is said to purge when injected into the veins; and if this statement is true, it must have an especial affinity for the intestines. On account of its mild and speedy action it is commonly used as a purgative for children, women with child, after parturition, in fevers, piles, and fissure of the anus. It is not a good purgative in habitual constipation, as it increases the torpid habit of the bowels. This effect of castor oil is constantly witnessed in children.

Croton oil is a powerful purgative, producing watery stools, with much depression. It is an uncertain purgative, sometimes acting in half an hour, at other times requiring much longer; large quantities, even six or eight drops, may be required; hence it is seldom used, unless, as in apoplexy, coma, and mania, it is important to administer a purgative of small bulk. It is sometimes employed in obstinate constipation when other purgatives have failed. Owing to its acrid taste, it is generally administered in form of pill, except to patients in a state of insensibility, when it is mixed with a little butter or lard, and conveyed to the back of the tongue, and is swallowed involuntarily, or trickles down the throat.

As these oils remain but a short time in the intestines, the greater part passes out with the motions. But little of the acrid matter probably passes into the blood, since, unless croton oil is swallowed in large quantities, there do not occur those serious symptoms witnessed when it is injected into the veins.

Like other purgatives, these oils may influence distant organs, as the kidneys, and act as diuretics.

Croton oil has been used in hydrocephalus, and it is asserted to have removed the excess of fluid from the ventricles of the brain.

Mr. Sewell, of Ottawa, Canada, recommends croton oil in sciatica, obstinate pleurodynia, and crick of the neck. He states that other purgatives cannot be substituted for croton oil. He lays great stress on the evacuation of blackened fæces by croton oil. No doubt some cases of sciatica depend on a loaded rectum or descending colon, when any purgative will be useful; but apparently these are not the cases referred to by Mr. Sewell. This treatment sometimes relieves, or even cures, patients who are not constipated, but it produces a good deal of temporary weakness.

Diarrhœa of children sometimes yields to eight or ten drops of castor oil suspended in mucilage. Unfortunately the indications for this treatment are unknown; hence it often fails, and is inferior to other methods.

It is a common practice, in the early stages of diarrhœa, to administer a dose of castor oil, or some other purgative, to carry away the irritant exciting the diarrhœa.

A drop of castor oil introduced into the eye will often allay pain and intolerance of light, produced by a fine irritant, as sand.

Castor oil may be taken in the following ways, without much taste: in beef-tea highly peppered and well salted; or the oil may be beaten up with an equal quantity of the froth of porter; this mixture must be tossed off before the constituents have separated. A mixture consisting of castor oil, half an ounce; fresh mucilage of acacia, three drachms; distilled water, five drachms, has very little taste. It may be flavoured with oil of peppermint or oil of lemons.

GLYCERINE.

Glycerine is a useful application for chapped lips or hands, and for rough, furfuraceous, and inelastic skin, left after eczema or other skin complaints. Glycerine of starch is still better. They restore to the tissues their suppleness, and allay burning, tingling, and smarting. Glycerine may cause inflammation and smarting, hence it should be mixed with an equal quantity of rose-water or eau de Cologne. In xeroderma the skin is made soft and supple by glycerine of starch. A bath should be taken daily, and the ointment rubbed in after wiping the body thoroughly dry. Glycerine is a good application for dryness of the meatus of the ear ; and when the tympanum is ruptured ; it covers the opening in the tympanum with a thin film, supplying for a time the place of the lost membrane.

The lips, tongue, and gums, when dry and coated with dried mucus in acute diseases, should be washed and kept moist by glycerine. This greatly improves the comfort and appearance of the patient. The glycerine must be applied several times a day. It sometimes answers best when diluted with an equal quantity of water or lemon juice, if the sweet taste of glycerine is unpleasant.

In the last stage of chronic diseases, as phthisis, the mucous membrane of the mouth becomes dry, red, shiny, and glazed. This condition of the mucous membrane causes much distress, and is usually accompanied by great thirst. These conditions may be modified or removed by washing the mouth with glycerine and water. If glycerine be used alone, it is liable to make the mouth clammy and sticky. Thrush may often be cured by the application of glycerine.

Glycerine of carbolic acid is a useful application to fœtid sores and open cancers of the surface of the body or of the uterus. It removes the offensive smell of the discharge, and improves the condition of the sore.

Glycerine of borax is a good application in pityriasis of the scalp, aphthæ, and thrush.

Glycerine has been used in place of sugar, as in diabetes. It has also been recommended as a substitute for cod-liver oil, but experience has failed to support the recommendation.

One of the best preventives of bed-sores is glycerine or glycerine cream. The part exposed to pressure should be washed morning and evening with tepid water, and carefully wiped quite dry with a soft towel, and then a little glycerine or glycerine cream rubbed gently over the part with the hand. If the skin is sore or tender, the glycerine cream is best. A draw-sheet will prevent soiling of the bed-clothes, but the draw-sheet must be made of linen, and sufficiently large to be firmly tucked in at both sides of the bed, as any folds or creases are very apt, by irritation, to produce tenderness, and eventually sores. This preventive treatment should be commenced before any redness or tenderness occurs.

ON DIFFERENT KINDS OF TANNIN.
ON GALLIC ACID.

THESE substances produce little or no change in the unbroken skin, but are astringent to sores and mucous membranes, checking secretion by contracting the vessels and condensing the tissues. They precipitate albumen, and thus coat over wounds; in some measure protecting them from the injurious action of the air, whence tannin-containing substances are applied to excoriations, profusely discharging sores, and luxuriant granulations. Tannin is conveniently employed in the form of glycerine of tannin. This combination is useful in ozœna. After measles, scarlet fever, or some other diseases, not uncommonly the inside of the nose becomes excoriated, reddened, and discharges freely a thin saneous or thicker purulent fluid, which on drying scabs up the nose, and often excites eczema of the upper lip. If the inside of the nose is well brushed out with glycerine of tannin, the discharge ceases, even after a single application. If the scabs are thick, they must be thoroughly removed to enable the application to act on the sore secreting surface. Glycerine of tannin cures syphilitic ozœna of children; it arrests the discharge, reduces the swelling of the mucous membrane producing the characteristic sniffling, and by enabling the child to breathe through the nose permits sound refreshing sleep and proper sucking, by these means greatly improving the child's health.

It is not uncommon to meet with adults suffering from an impetiginous eruption of the inside of the nose, most severe near the orifice where the hairs grow, but extending higher in a milder form. Scabs block up the nose, especially at night. The alæ, and sometimes the whole of the nose, is thickened, dusky red, and very painful. The swelling may extend to the adjacent structures, and repeated attacks of erysipelas of the face are sometimes provoked. Glycerine of tannin, applied once or twice daily to the whole cavity of the nose, speedily reduces and even cures this disease. The upper part of the nose is the most easily cured, but the disease situated in the hairy part is much more obstinate, and is very prone to return again and again. In obstinate cases the addition of epilation is useful. Glycerine of starch or zinc ointment, applied several times a day, is useful in addition to this treatment, as they keep the tissues moist and supple.

The nasal discharge of thick, lumpy, greenish-black, and stinking mucus, may generally be checked by glycerine of tannin. If less successful, it mostly removes the offensive smell. In other forms of ozœna, especially where the disease affects the upper and back part of the nose, with its numerous recesses, it is preferable to flush the nose with deodorizing and astringent washes, in the way described (*vide* page 143). Besides benefiting the mucous membrane, the stream of fluid carries away the inspissated putrefying discharge on which the stench of ozœna generally depends.

Glycerine of tannin is very valuable in otorrhœa, a common complaint of weak unhealthy children after severe illnesses. The external meatus must be filled with the application, and this must be retained there by cotton-wool. One application usually suffices, but a slight discharge may remain, or return in a few weeks, when a repetition of the application is necessary. In acute inflammation of the meatus this treatment is inapplicable until the acute disease subsides. Chronic vaginitis of children is often cured by this application. This complaint is generally more obstinate than either ozœna or otorrhœa.

Glycerine of tannin is useful in some stages of eczema: when the skin is inflamed, red, swollen, and weeps, on removing the scabs, and painting the raw surface with this preparation of tannin, the discharge, redness, heat, and swelling much diminish. A poultice must be applied at night; and if the glycerine of tannin excites much pain, the poultices must be continued night and day. In a less active stage, when the tissues are not so red and swollen, and weep less, eczema yields still more readily to glycerine of tannin, applied twice or thrice daily. A poultice is useful at night. This application quickly allays the troublesome itching, tingling, and burning so common in eczema; hence it prevents tearing with the nails and rubbing, which hinder healing, nay, even cause the eczema to spread,—thus the well-doing of the patient is promoted, as itching and burning often greatly disturb sleep. Glycerine may not entirely remove the disease, but only reduce it to the desquamative stage, with a tendency to crack and ooze, when tar, carbolic acid, or other ointments become necessary to complete the cure; the same treatment is useful in impetigo: a poultice must be applied each night to remove the scabs, and the tannin application should be employed during the day. While treating these skin diseases, the state of the digestive organs must not be overlooked, but anything wrong must be remedied.

Eczema of the ears, common in middle-aged and old people, readily yields to glycerine of tannin. Eczema behind the ears of children is admirably treated with this remedy. The eczema speedily dries up and heals after one or two applications, although it may have lasted for weeks or months. The gums, if red and swollen, must be lanced, and other irritations removed.

Intertrigo is sometimes benefited by glycerine of tannin.

Glycerine of tannin is very useful in many throat diseases. Immediately after an acute inflammation, as the mucous membrane grows less red, less swollen, becomes moister, and covered with mucus or pus, glycerine of tannin painted on the pharynx hastens recovery, prevents chronic inflammation, with relaxation of the mucous membrane, which often follows the acute disease, heals superficial ulceration occurring as the acute inflammation subsides, and cures hoarseness.

Glycerine of tannin is useful in aphthous sore throat, on the appearance of ulceration. In chronic inflammation of the throat, when the mucous membrane is relaxed, granular-looking, and covered with mucus or pus, a few applications of glycerine of tannin brace up the tissues, and lessen or remove the hoarseness. This kind of throat is common in children, often producing deafness and a frequent hacking cough, which may keep the child awake the greater part of the night. Glycerine of tannin applied daily allays the cough, and cures the deafness. Throat deafness is the most common form of deafness in childhood; and when not due to enlarged tonsils, it generally depends upon the kind of throat just described.

Many coughs depend on the state of the throat, a fact accepted in theory, but very little applied in practice. Glycerine of tannin is very useful in these coughs, allaying the cough and frequent deglutition excited by an elongated uvula; also the frequent hacking cough in phthisis, due to inflammation or ulceration of the throat. A good night's rest may be often obtained by painting the throat shortly before bed-time. A small quantity of morphia added to the glycerine of tannin increases its soothing effect. The frequency and violence of the paroxysms of whooping-cough are much reduced by mopping the pharynx, epiglottis, and adjacent structures with this application. It is of little use if the case is complicated with catarrhal or other inflammation of the lungs, or tuberculosis, or any irritation, as from teething; but in simple uncomplicated whooping-cough it is very useful. The paroxismal cough often left by whooping-cough, or which readily returns on catching cold, yields to this treatment. In whooping-cough and the foregoing throat diseases, glycerine of tannin is better than a solution of nitrate of silver, as it excites less pain, and has a less disagreeable taste. Glycerine of tannin is greatly superior to tannin lozenges.

Glycerine of tannin is useful in ulcerative stomatitis, especially in that form affecting only the edges of the gums. Dried alum is a better application.

Trousseau successfully employed a solution containing five per cent. of tannin, in the form of spray, in diphtheria and croup.

He applied the spray several times a day, for fifteen or twenty minutes.

Tannin combines with albuminous substances in the stomach, forming an insoluble substance, and any left uncombined constringes the mucous membrane, lessening its secretions. As it also diminishes the solvent power of the gastric juice, it is inadvisable to give tannin-containing substances close to meal-times.

It is asserted that tannin, by its astringency, cures slight catarrh of the stomach; hence tannin preparations are occasionally employed in irritative dyspepsia. Some persons give tannin for pyrosis, but they do not state whether it checks neutral, alkaline, or acid pyrosis, or all these forms of the complaint. Tannin is employed in poisoning by alkaloids, as strychnine and morphia, to render them less soluble. Tannin and gallic acid control bleeding from the stomach. The members of this group are astringent to the intestines, lessening their secretions, and probably their contractions; hence they constipate, and tannin-containing substances, as catechu, kino, red gum, rhatany, and hœmatoxylum, are very useful in most forms of acute and chronic diarrhœa, on account of their astringency. The members of this group are employed as anal injections to check diarrhœa, to destroy thread-worms, and to prevent prolapsus ani.

Few applications are so useful in irritable piles as gallic acid and opium ointment. It quickly relieves pain, and after a time even reduces the size of the hæmorrhoidal tumours.

Owing to their low diffusion-power, the members of this group must pass but slowly from the intestines into the blood. After, if not before, their absorption into the circulation, they must become neutralized with albumen, and for this reason some authorities maintain that tannin and its allies cannot act as astringents to organs distant from the intestines. Nevertheless, tannin and gallic acid are frequently employed with considerable benefit to check bleeding from the lungs, uterus, and kidneys, and with less apparent benefit to check too abundant secretion of milk, and profuse sweating.

Tannin is sometimes administered to diminish the loss of albumen in chronic Bright's disease. George Lewald has experimentally tested its power in this respect. In a few, but carefully conducted, experiments he found that the albumen was always lessened to an inconsiderable amount. The daily average diminution amounted to about 0·66 grammes. Tannin produced a much more decided increase in the quantity of the urine.

An injection of glycerine of tannin is very beneficial in the after-stages of gonorrhœa, and in gleet. If undiluted, glycerine of tannin commonly excites much pain; it is desirable therefore to add to it an equal quantity of olive oil or mucilage. Two drachms of this mixture is enough for each injection. If too much is used, it excites frequent and painful micturition. Very often gleet is speedily cured by this injection; but, like other injections, in many instances the discharge only ceases during its employment, returning on its discontinuance.*

Tannin alone, or mixed with other astringents, is useful as an injection in leucorrhœa. In obstinate cases, and when the os uteri is ulcerated, a bolus of tannin and cocoa-nut fat applied to the mouth of the uterus is very beneficial. Glycerine of tannin checks the great discharge, and removes the offensive smell, of cancer of the uterus. A mixture of glycerine of tannin and glycerine of carbolic acid is still more useful.

The effect of the members of this group on the natural constituents of the urine is unknown. Gallic acid "passes unchanged into the urine. It has been detected in one hour after being taken." Tannic acid "passes off by the urine in the forms of gallic and pyro-gallic acids, perhaps of a saccharine body." (*Parkes.*)

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* Urethral injections must not be employed at bed-time, or they are apt to excite seminal emissions. They should be persevered with eight or ten days after the discharge has ceased.

TAR.
CREASOTE.
CARBOLIC ACID.
PETROLEUM.
OIL OF TAR, ETC.

CARBOLIC ACID destroys the lowest forms of animal and vegetable life, and prevents fermentation and putrefaction. It is then termed a disinfectant and deodoriser. It is largely employed to prevent the stenches of drains, water-closets, dissecting rooms, and hospital wards. Unlike chlorine and permanganate of potash, carbolic acid is incapable of destroying offensive gases; it only prevents their formation. Its destructive influence over the low forms of animal and vegetable life has led to its being considered a disinfectant, but no satisfactory proof exists of its capability of destroying the contagious elements of disease. Nevertheless it is largely employed as a disinfectant. It is advised to hang a sheet large enough to extend beyond the crevices of the door of the patient's room, and to keep this sheet moist with a solution of carbolic acid.

Creasote and carbolic acid act energetically on the skin, producing opaque white patches, and exciting active inflammation, followed in a few days by desquamation. They coagulate albumen, and are stimulant and astringent; hence they may be employed to check bleeding.

As a stimulant and antiseptic applied to gangrenous and offensive smelling sores, carbolic acid prevents the stench, and improves the condition of the wound.

Professor Lister employs carbolic acid largely in the treatment of wounds. His views may be briefly summarized, thus:—when blood is effused into healthy tissues, it is generally absorbed, exciting no inflammation, suppuration, or fever. If, however, the skin is broken, so that the wound communicates with the air, the effused blood quickly decomposes, exciting both inflammation and suppuration. That these phenomena are not excited by the air itself, but by the organic germs floating in it, and that if the air coming in contact with the wound can be freed of these, then neither putrefaction of the blood, nor the consequent inflammation and suppuration can take place. Further, he has made experiments showing that if these germs are prevented reaching a wound or abscess, their granulations and walls will not form pus, but only a little serum. Now as carbolic acid completely destroys these organic floating germs, he filters the air before it reaches the wound, through dressings impregnated with this agent.

Concerning contused wounds he says, "All the local inflammatory mischief and general febrile disturbance which follow severe injuries are due to the irritating and poisoning influence of decomposing blood or sloughs. For these evils are entirely avoided by the antiseptic treatment, so that limbs which otherwise would unhesitatingly be condemned to amputation may be retained, with confidence of the best results."

Lister first washes the wound thoroughly with a watery solution of carbolic acid, containing, for contused wounds, one part of crystallized carbolic acid to twenty of water, and one part to forty for simple incised wounds, so destroying any septic germ already in contact with the lesion. To prevent the subsequent access of septic germs, he formerly covered the wound with a piece of lint or linen soaked in a solution of carbolic acid and olive oil, carefully strapping down its edges with plaster; but he now covers the wound with a lac plaster,[*] extending "freely beyond the wound at every part, so that the discharge may have to travel a considerable distance beneath the impermeable antiseptic layer." The greatest care is necessary in changing the dressing, especially with contused wounds. "For the antiseptic injected into the wound on the previous day having been absorbed, the extravasated blood and any portion of tissue killed by the violence of the injury, are as susceptible of putrefaction as if no such treatment had been pursued."

Lister, counselling the adherence to the minutest details of his plan, observes that "experience leads him to believe that if, when the dressings are removed, a single drop of serum were to be pressed out by the movement of the limb, and then regurgitate into the interior after being exposed, even for a second, to the influence of septic air, putrefaction would be pretty certain to occur." In redressing a wound he recommends "the employment of a syringe, the muzzle of which is inserted beneath the margin of the lac plaster, and as this is raised a stream of watery solution of carbolic acid (one to forty) is made to play upon the wound till a piece of calico soaked with the same solution has been placed upon it." "Any examination of the wound that may be desired is made with freedom through the transparent solution thrown over it by the syringe." Lister changes the dressing on the day following the injury, but afterwards the frequency of the dressing must be regulated by the amount of discharge. After the first day or two he protects the wound from contact with the carbolic plaster, to prevent irritation of the delicate structures and the formation of pus. He says, "After the first dressing, the object I always aim at is to have the material in contact with the exposed tissues approximate as closely as possible to the perfectly bland and neutral characters of the living healthy tissues." The material placed between the wound and the carbolic plaster he terms "the protective." "It is essential that the protective should be antiseptic at the moment of its application, otherwise there will be a risk of its communicating septic germs." The protective he employs is made of oiled silk "brushed over with a mixture of one part of dextrine, two parts of powdered starch, and sixteen parts of cold watery solution of carbolic acid (one to twenty). The carbolic acid solution is used rather than water, not for its antiseptic property, but because it makes the dextrine apply itself more readily to the oiled silk, and the granular starch is used for a similar purpose." "Oiled silk thus prepared becomes uniformly moistened when dipped in a watery solution of the acid, so that all risk of communicating putrefactive mischief along with it is avoided." The protective must be everywhere well overlapped by the antiseptic lac plaster.

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[*] This plaster is made with a mixture of three parts of shellac to one of crystallized carbolic acid. This mixture "is incorporated with a soft cloth instead of being spread upon starched calico. It is thus rendered beautifully flexible, and at the same time much more durable." "As in this form it is very thin, it is well where much discharge is anticipated, or where a long time is intended to elapse between the dressings, to use it in two layers." The plaster can be obtained at the old Apothecaries' Company, Glasgow.

When this treatment is used after an operation, the ligatures should be cut short, and left in the wound, or the arteries closed by torsion.

Lister treats abscesses by a modification of the above plan. The incision is to be made under a piece of rag dipped into a solution of carbolic acid and oil, the pus is then to be thoroughly squeezed out of the abscess, but the rag covering the wound must not be removed. The further dressing is to be conducted as with an incised or contused wound. If the discharge from the abscess is very abundant, the dressing must be changed every twelve hours.

This treatment, Lister says—and the author's experience fully bears him out—prevents, in some instances, suppuration in the cavity, the old stimulus being removed, and the new one of decomposing matter prevented. With small abscesses, such a favourable termination is indeed the rule, and with large and even enormous abscesses, psoac and iliac, but little fresh matter is formed, and the patient is thus preserved from the exhausting effects of an abundant and prolonged discharge. So striking are the good effects of this treatment, that in twenty-four hours the discharge often ceases to be puriform, and the walls of the abscess quickly unite. The dressings must be continued till the wound has quite healed. On no account must the lint be raised to inspect the wound, as such perverse curiosity will certainly ensure the complete failure of the treatment.

Professor Lister says it is of no consequence whether the opening into the abscess is dependent or not, as the contracting pyogenic membrane soon obliterates the cavity. It may not be out of place to again insist that the success of this treatment depends entirely on the rigorous care taken to carry out Lister's directions in order to prevent the passage of any septic germs into the wound.

The empyreumatic oils and their derivatives are very useful in many chronic skin affections, as chronic eczema, psoriasis, erythema. The odour of oil of cade or oleum rusci is less disagreeable than that of tar, liquor carbonas detergens, and carbolic acid. Dr. McCall Anderson strongly recommends these oils, especially liquor carbonas detergens, oil of cade, and oleum rusci. In most cases they afford immediate relief from the tormenting itching of chronic eczema, psoriasis, erythema, and prurigo. If long continued, they excite inflammation of the hair follicles, forming papules and pustules, with a black spot in their centre. Hebra terms this eruption tar-acne. They often excite considerable inflammation in delicate skins.

After the subsidence of inflammation, these oils are useful in chronic eczema, especially when only a little redness, itching, and some desquamation remain. Sometimes pure tar succeeds better than its ointment, but it is contra-indicated if there is inflammation, or if the surface is raw and weeping; for then it will excite great pain and inflammation. Local forms of eczema, as that kind occurring on the back of the hands, is in some instances much improved by the application of undiluted petroleum; but as this is generally very painful, other and milder remedies should first be tried.

Provided inflammation runs not too high, carbolic-acid ointment, composed of ten minims of the acid to an ounce of lard, is useful in the weeping stage of eczema, moderating the disease, and allaying the tingling and itching. It is useful in the eczema of the head of children.

Psoriasis may be very efficiently treated by the external application of these remedies. Tar, or its ointment, seldom fails to effect much good in chronic psoriasis. Some of the most obstinate forms of this disease may often be cured by painting the pure undiluted tar over the patches of the eruption, allowing it to remain till it wears gradually away. If the unsightliness of the tar ointment is objectionable, the creasote ointment recommended by Mr. Squire may be substituted. It is composed of two or three parts of creasote to one part of white wax. This powerful ointment must be applied only to the patch of psoriasis, not on the adjacent healthy skin, otherwise it will blister. To avoid staining exposed parts, Dr. McCall Anderson sponges the eruption three or four times daily with a wash composed of crystallized carbolic acid, two drachms; glycerine, six drachms; rectified spirits, four ounces; distilled water, one ounce. But he considers carbolic acid inferior to tarry preparations. He strongly insists on the necessity of rubbing in the ointments till they have nearly disappeared, and of washing them off with soap and water before each fresh application, otherwise they become rancid.

Petroleum soap, cade soap, and carbolic soap are useful in both chronic eczema and psoriasis. As these soaps are made of different strengths, if one kind prove too strong and irritating, a milder form may be substituted. Carbolic soap is used by medical men, especially by accoucheurs and surgeons, to free their hands from infectious or noxious matters which might endanger the safety of their patients.

A weak solution of carbolic acid is a very useful injection or wash for the cavities of large abscesses, or in empyema, after the evacuation of pus. This injection is used to correct the fetor arising from cancer of the womb, or other uterine diseases. It is said that carbolic acid will remove the stench and lessen the discharge in ozœna.

The inhalation of creasote or carbolic acid, ten to twenty drops in boiling water, is useful in bronchitis, lessening in some cases over-abundant expectoration. It will generally remove that fetor of the breath occasionally met with in bronchitis, and sometimes even that due to gangrene of the lung.

Creasote mixed either with tannin or opium, introduced into the hollow of a decayed and painful tooth, often gives relief.

A creasote or carbolic gargle or wash proves very efficacious in sloughs of the mouth or throat, removing the offensive smell, and producing a healthier action in the sore.

Small doses of creasote excite no particular symptoms in the stomach, but large quantities produce a sensation of burning at the epigastrium, accompanied by nausea and vomiting.

During its transit through the intestines, creasote does not appear to undergo any change in its composition, as its characteristic smell may be detected in every part of the canal. Creasote checks the vomiting of various diseases, as that of pregnancy, sea-sickness, cancer, ulcer of stomach, Bright's disease. It often relieves stomach pains occurring after food.

The investigations of Dr. Sansom, who first employed sulpho-carbolates in medicine, prove that these salts arrest fermentation in different degrees, sulpho-carbolate of soda being most efficient; then follows a salt of magnesium, then of potassium, then of ammonium. Administered to animals, they prevented putrefaction and decomposition of urine, although Sansom could not detect any of the salt in this excretion. He gave sulpho-carbolate, and afterwards collected and preserved the urine, which after six months had not decomposed.

Sulpho-carbolate of soda and carbolic acid are extremely useful in flatulence, especially when there is great distention, unaccompanied by pain, heartburn, or other dyspeptic symptoms. Extreme flatulence, producing copious eructations and considerable distension, symptoms not uncommon in middle-aged women and phthisical patients, are generally relieved by sulpho-carbolate of soda, although they may have resisted other medicines. If the flatulence occurs immediately after a meal, ten or fifteen grains of sulpho-carbolate of soda should be taken just before food; if the flatulence occurs some time after meals, the medicine in the same dose should be taken half an hour after food.

Creasote has been given in cholera and typhus fever, but apparently without much benefit.

Creasote passes into the blood, and its odour is detectible in most of the organs, showing that it probably remains entirely, or in chief part, unaltered in the blood.

Tar, creasote, and carbolic acid have been given in bronchitis and in phthisis to check both the quantity of the expectoration and its offensiveness. Tar-water in two-drachm to half-ounce doses, is frequently given in bronchitis to diminish expectoration. Dr. Anderson gives tar in chronic eczema. He begins with three or four minims in treacle, pill or capsules, gradually increasing the dose to ten or fifteen minims three times a day. In gangrene of the lungs, creasote is employed to obviate the fetor of the expectoration. It is of doubtful efficacy when swallowed, but as an inhalation it certainly succeeds.

Tar and creasote are reputed to be diuretics. They may possibly act on the urinary tract, as some of the ingredients of tar pass off with the urine, changing its colour and odour. The urine, in health, contains a trace of carbolic acid. As carbolic acid and sulpho-carbolates administered by the stomach prevent decomposition of the urine, these may possibly prove useful by keeping the urine sweet in cystitis, enlarged prostate, and paralyzed bladder.

Dr. Lloyd Roberts, of Manchester, was one of the earliest to draw attention to the virtues of carbolic acid, now often employed in ulcer of the os and cervix uteri, in chronic inflammation of the uterus and cervix, with excoriation, and in chronic uterine catarrh. "I use," says Dr. Roberts, "invariably the pure acid. A capital plan for maintaining the fluidity of the acid, devised by Mr. Weir, of Dublin, and recommended by Dr. Roe, is to add a few grains of camphor to a little of the acid. In simple ulceration, a free application of the acid drawn over the surface twice a week is sufficient. When it is necessary to apply the acid to the interior of the cervical canal of the uterus, I use a charged camel-hair pencil or a gum-elastic catheter, having previously removed, with a piece of lint or injection of water, any mucus likely to impede its proper application. In applying it to the interior of the uterus by injection, it is very important to have the cervical canal freely open, which, however, with the exception mentioned above, is generally the case. Where it is not so, recourse must be had to dilatation with a sponge tent, so that any superfluous injection may pass freely out, neglect of this precaution producing much uterine colic, and rendering the woman liable to metritis. Care should also be taken to ascertain the direction of the uterus by the sound, as in cases of retroflexion any of the injection passing beyond the curved portion of the organ, and retained there, would be certain to produce dangerous consequences. When injected into the uterine cavity, the acid should be diluted with glycerine and water, commencing with a weak solution, gradually increasing the strength as circumstances require. I also use the acid, dissolved as above, freely as an ordinary injection in vaginal leucorrhœa, uterine ulceration, and cancer; and it will be found an excellent cleanser, healer, disinfectant, and allayer of pain. Assuming the correctness of these views, I feel warranted in repeating that carbolic acid as a local application in uterine diseases is especially useful, occupying, as it does, in escharotic power a position intermediate between the milder nitrate of silver and the more powerful corrosive caustics, potassa fusa, the mineral acids, acid nitrate of mercury, etc. More energetic than the first-named salt, it is at the same time free from the danger to neighbouring structures which attends the use of the more potent caustics. Although its action does not penetrate below the diseased surface, it possesses in equal degree with the stronger caustics the property of changing the vitality of the tissues, and produces rapid cicatrization, dissipates the inflammation and hypertrophy, and relieves pain. By its disinfectant action it destroys the offensive odour of purulent and other discharges, and acts beneficially upon the unhealthy, lax, and discharging vaginal mucous membrane. Unlike most other caustics, if applied only to the diseased surface, it does not cause pain."

An injection composed of twenty grains of sulpho-carbolate of zinc to eight ounces of water, used twice or thrice daily, is useful in gonorrhœa.

Whilst this chapter was in the press, Professor Lister has introduced a modification of his treatment of wounds. The superiority of oakum dressings, in some respects, to his antiseptic applications led to these improvements. Lister says, "Having heard reports from various quarters of the efficacy of oakum, I have lately put it to the test with granulating sores, and I have found it more than answer my expectations. The reason for its superiority over oily cloths is readily intelligible. Each fibre of the oakum is imbued with an insoluble vehicle of the antiseptic; so that the discharge in passing among the fibres cannot wash out the agent any more than it can when flowing beneath the lac plaster, to a narrow strip of which an individual oakum fibre is fairly comparable.

"Oakum not only proved efficient antiseptically, but presented several advantages over lac plaster. When the latter is left as a dressing for several days together, the discharge, even though small in amount, soaking into the absorbing cloths, loses the carbolic acid it had received from the plaster, and, putrefying from day to day, assumes an acrid character, and sometimes produces most troublesome irritation of the skin. This is, of course, avoided by the oakum. Again, the lac plaster, being quite impermeable to watery fluid, keeps the skin beneath it moist, and, in fact, covered with a weak watery solution of carbolic acid, which, I suspect, insinuates itself, more or less, beneath the protective, and maintains a slight stimulating influence upon the parts beneath it. But oakum, draining away the discharge as fast as it is effused, avoids this source of disturbance. The result is, that if a granulating sore is thoroughly washed with an antiseptic lotion, and covered with 'protective' and a well-overlapping mass of oakum secured with a bandage, a dressing is provided which nearly approaches the ideal I have long had in view. For, as granulations do not form pus, or even exude serum except when stimulated, a persistent antiseptic, combined with an efficient protective, should constitute a more or less permanent dressing, under which discharge should cease, and cicatrization proceed with great rapidity. Accordingly, ulcers of the leg treated in this way have been found, when exposed after the lapse of several days, either entirely healed or greatly advanced in the process, while the moisture beneath the protective has been of a serous character, and the discharge collected in the oakum comparatively small in amount. Lastly, the lac plaster has this further disadvantage from the moisture beneath it, that it prevents efficient strapping in cases that require it. But under oakum an adhesive plaster retains its hold as well as under dry lint."

He now uses a folded muslin cloth of open texture, imbued with the following mixture: sixteen parts of paraffin, four parts of resin, and one part of crystallized carbolic acid.

"Cheap muslin gauze dipped in the melted mass, and well wrung or pressed while hot, is an elegant and convenient form of modified oakum. It should be folded into about eight layers; and in order to prevent the discharge from soaking too directly through it, a piece of thin gutta-percha tissue may be placed beneath the outer layer to guide the fluid towards the edge of the cloth."

MUSK.
CASTOREUM.

These medicines, although highly esteemed, especially musk, by Graves and Cullen, are but seldom used.

Their peculiar and characteristic smell is oppressive and sickening, and may cause headache, giddiness, and even fainting; hence musk is ill adapted for the sick room; if used at all, stimulating and exhilarating scents are preferable.

These substances have a bitter taste.

Jörg asserts that musk, in two to five-grain doses, causes weight at the stomach, eructations, dryness of the œsophagus, heaviness of the head, giddiness, headache, followed by sleepiness, faintness, and a sensation of heaviness in the whole body; and in very large doses, trembling of the limbs, and even convulsions. The pulse is strengthened and quickened. Trousseau and Pidoux failed to obtain many of these symptoms, only noticing headache, with giddiness; the pulse was neither strengthened nor quickened.

These remedies are employed in melancholia, and for many of those anomalous but distressing symptoms grouped under hysteria. They have been given in chorea, epilepsy, whooping-cough, nervous palpitation, cramps of different parts of the body, and even in tetanus.

Dr. Graves employed musk in typhus and other fevers, to prevent prostration, and to strengthen a weak and feeble pulse.

ALCOHOL.

For many reasons alcohol might be grouped conveniently with chloroform and ether, there being much similarity in the action of these three medicines. Each, at first, produces much excitement, with increased strength of the pulse, this stage after a time giving way to another of unconsciousness, which may be profound. But with this general similarity there is an important difference between alcohol on the one hand, and chloroform and ether on the other. With chloroform and ether the stage of excitement is brief, soon passing into that of insensibility, which may endure a long time without danger to life. But with alcohol the early stage of excitement and intoxication is of considerable duration, insensibility and unconsciousness not being reached until very large quantities have been taken, and some time has passed. In this stage of insensibility the danger of death is imminent from paralysis of the heart and of the movements of respiration. It will be easily understood, therefore, that while chloroform and ether are used as anæsthetics, alcohol is inadmissible for this purpose, and is of service only in its early and stimulating stage.

Owing to its volatility, alcohol is sometimes employed to abstract heat, and cool the surface of the body, as in inflammation of the brain, etc. It is not a very effectual refrigerator. Ice is preferable.

If its evaporation is prevented, it penetrates the skin, owing to its tolerably high diffusion-power, and excites the tissues beneath the cuticle, causing a sensation of heat and some inflammation. It may be employed thus as a counter-irritant.

It coagulates albumen, and is sometimes used to form over sores a thin protective layer, which, by excluding the air, promotes the healing process. Alcohol, in the form of brandy or eau de Cologne, is often applied to harden the skin of parts exposed to pressure, and to obviate the occurrence of bed-sores. This excellent practice should be adopted before the skin is abraded, and even before any redness occurs.

It is a useful practice to bathe the nipple with brandy each time after a suckling, then carefully to wash the part, and wipe it dry. The application of the brandy may be applied profitably some days before delivery, so as to harden the tissues of the nipple, and prevent the formation of cracked nipples, which give rise to so much pain and distress.

In virtue, probably, of its power to coagulate albumen, and perhaps of other properties, it constringes to a small extent the mucous membrane of the mouth, and, diluted with water, is sometimes used as an astringent gargle in relaxed throat, scurvy, salivation, etc.

In the stomach it exerts a double action. Thus it may affect both the gastric juice and the secreting mucous membrane. Its action on these will be considered separately. If the quantity of alcohol is small, its effect on the pepsin of the gastric juice is insignificant; but large quantities destroy the pepsin and its power to dissolve food.

As with the gastric juice, so with the mucous membrane, the effect of alcohol differs according to whether large or small quantities are taken. In very moderate doses it has been experimentally proved to increase the secretion of the gastric juice, and every-day experience confirms this fact. After large quantities the appetite is destroyed, the stomach upset, its mucous coat inflamed, and covered with a thick tenacious mucus, and its secreting power abolished.

Owing to this influence on the functions of the stomach, alcohol is very useful in disease, as the following examples will illustrate :—

It not uncommonly happens that a person when much fatigued loses all appetite and digestive power, and, if he takes food, suffers from an undigested load on the stomach. In such a case a glass of wine or a little brandy and water, taken shortly before food, will restore appetite and digestion.

Again, convalescents from acute diseases, whose digestion and strength may remain a long time depressed, derive great benefit from alcoholic stimulants taken just before or at meal-times.

Another class, the dwellers in towns, who lead a sedentary life, whose digestion being often very weak, find that their food can be properly digested in sufficient quantity only by the help of alcohol in some form.

Stimulants are most serviceable in the prostration from acute illness. In common with the other functions, digestion is then much depressed, while it is most important to support the strength until the disease has done its worst. The strength can best be supported by food, but the weakened stomach can digest but sparingly. In such critical circumstances alcohol spurs the flagging digestion. The stimulant should be given with food. It is important to insist on this point, as it is common with both medical men and the laity to trust to alcohol alone, forgetting that while it benefits by stimulating the heart, it also very effectually aids the digestive process, and thus supports the patient in the best and most natural manner.

To a patient labouring under great prostration, in whom digestion is very feeble, food and stimulants should be mixed together, given in small quantities, and frequently repeated. A stronger patient had better take food at the ordinary meal-times, as from habit the stomach digests better under such circumstances.

It has been mentioned that large quantities of alcohol excite catarrh of the stomach; but it is singular how large an amount can be taken by persons prostrated with fever, without such a result. The same fact may be noticed in convalescence from exhausting diseases. Still, care must be exercised in the administration of stimulants, since it sometimes happens that too freely given they upset the stomach so that all food is vomited, an untoward circumstance greatly adding to the patient's danger.

The prolonged indulgence in alcoholic drinks, after a variable time, seriously damages the stomach by producing chronic catarrh. The mucous membrane, coated with tenacious mucus, excites unhealthy fermentation in the food, while the structure of the membrane itself undergoes considerable alteration by great increase of the connective tissue, which, by its contraction, obstructs and destroys the secreting follicles and their lining cells. The mucous membrane thus becomes thickened, hardened, and uneven; and, owing to obliteration of the orifices of follicles, cysts are formed in its substance, which enlarge from the accumulation of cells within them.

In consequence of these serious changes little gastric juice is poured out in response to the demand made by the food, while the unhealthy mucous coating of the stomach exciting morbid fermentations, induces the production of much gas, with various acids, such as butyric, acetic, etc., whence acidity and heartburn. Morning vomiting of a scanty, sour, bitter, and tenacious fluid is a characteristic symptom of this condition.

Owing to its high diffusion-power, alcohol passes readily into the blood, so that but little can reach far into the intestines. Spirits, especially brandy, are often successfully employed to control the after-stages of acute simple diarrhœa, after the removal of the exciting irritant, and when the relaxed condition of the mucous membrane allows the liquid parts of the blood to pass into the intestines, producing frequent watery stools.

Even in large quantities alcohol appears neither to promote nor to hinder the conversion of starch into sugar.

Observations on the influence of alcohol on the blood and organs have yielded contradictory results, the most recent and elaborate investigations of Drs. Parkes and Wollowicz clashing in most particulars with those of previous experimenters. Hitherto it was held that alcohol diminishes the oxidation of the body, but Parkes' and Wollowicz's observations are opposed to this conclusion. Dr. G. Harley found that alcohol in small quantities added to blood withdrawn from the body, lessened its absorption of oxygen and its elimination of carbonic acid.

As the result of a great many observations taken every quarter of an hour for several hours, on persons of all ages, the author, in conjunction with Dr. Rickards, found that alcohol, brandy, and wine diminish the body temperature. After moderate doses, the fall was slight, amounting to not more than 0·4 to 0·6° Fahr., but after poisonous doses the depression in one instance reached nearly three degrees; in rabbits the fall was much greater, reaching to ten or more degrees. These observations have been confirmed by Professor Binz, of Bonn, and by Dr. Richardson, who asserts that all alcohols reduce the animal temperature. Drs. Parkes and Wollowicz, whose observations are opposed to the foregoing, gave to a healthy young man, in divided quantities, for six days, a daily amount of absolute alcohol varying from one to eight ounces, and on a subsequent occasion twelve ounces of brandy daily for three days. The temperature of the body was observed every two hours. The average temperature of the alcohol and of the brandy-drinking days was found to be almost identical with that when only water was taken. It is difficult to reconcile these conflicting results; but it must be granted that a considerable quantity of alcohol repeated several times a day does not permanently reduce the body-temperature. It is possible that alcohol when given in repeated doses may soon lose its power of depressing the temperature. Excessive habitual indulgence appears to have this effect; for Dr. Rickards and the author gave to an habitual drunkard, making him dead drunk, twelve ounces of good brandy in a single dose, without the smallest reduction of the temperature.

In their experiments on the urine, Böeker and Hammond found that "the formation of urea, of the extractives, and of sulphuric acid and phosphoric acid, was lessened by alcohol and beer; the water and free acidity of the urine was diminished; but in Parkes' and

Wollowicz's observations, alcohol, brandy, and claret produced no decreased elimination by the urine of urea, phosphoric acid, or free acidity. They however increased the amount of urinary water.

Edward Smith found that brandy and gin diminishes, while rum increases, the pulmonary carbonic acid. These conflicting statements it is impossible to reconcile; but Parkes' observations were so carefully conducted, and are so complete, that they must be accepted as authoritative.

How much alcohol is consumed in the body? The results of investigations to determine this point are so contradictory, that it is impossible to decide the value of alcohol as a food. Bouchardat, Sandras, and Duchek conclude that alcohol is freely consumed in the body, little escaping by the urine, unless very large quantities are taken. On the other hand, Perrin, Duroy, and Lallemand deny that alcohol is consumed in the smallest degree in the body. From his recent careful experiment, Anstie concludes that the greater part of the alcohol is consumed, and he has undoubtedly proved that only a little escapes with the urine, while Parkes and Wollowicz believe that a considerable quantity escapes with the sweat and breath. Amid these conflicting statements, physiology here failing to guide our steps, it is obvious that in estimating the value of alcohol in health or disease, we must rely solely on experience, which plainly shows that alcohol is not a necessary or even a useful article of diet for the healthy. Varied, repeated, and prolonged experience, and the testimony of army medical men, prove that troops endure fatigue and the extremes of climate better, if alcohol is altogether abstained from. The experience of the celebrated Moscow campaign showed this. During arduous marches it has always been found that, if water only is taken, the health of the men is exceptionally good, but, as soon as spirits are allowed, disease breaks out.

Trainers have long recognized the fact, that the power of sustained exertion and resistance to fatigue is greatest when alcohol is abstained from; the ill-health of athletes depends, not on the rigour of the system to which they are subjected, but on the excesses they indulge in after the contest for which they trained.

There can be no doubt that alcohol is not needed by the healthy, who are capable of the fullest amount of mental and physical exertion without it; nay, they are better without it.

It must be recollected, however, that these remarks apply to pure alcoholic drinks, as spirits, and not to beers and wines which contain, in different quantities, ingredients highly useful as food. The amount of alcohol in the lighter beers and wines is small, and can hardly be prejudicial to the robust, while they brace up and improve the flagging functions of the weakly, as town-dwellers, especially those who pass much of their time indoors, in an unhealthy atmosphere. Some indeed cannot properly digest their food without a stimulant.

Dr. Anstie speaks highly of alcoholic stimulants in the debility of old age, especially in the "condition of sleeplessness attended often with slow and ineffectual digestion,' and a tendency to stomach cramps." He employs "a generous and potent wine," containing much ether.

The pain of neuralgia may often be relieved by alcoholic drinks, especially by those containing a large quantity of volatile ether, the alcohol removing the temporary nervous depression which produces the paroxysm. The distressing symptoms occurring in so-called hysteria, generally met with in middle-aged women, are temporarily relieved by alcohol. As the stimulant must be taken in increasing quantities, there is great danger lest the patient should acquire the habit of taking alcohol to excess. This subject has of late been much dwelt on by Dr. Anstie, who cautions medical men against recommending their nervous or neuralgic patients the use of alcohol drinks. Many women become in this way confirmed tipplers. It behoves, then, the doctor to be very guarded in his recommendation of alcoholic stimulants.

Whatever doubts there may be concerning the usefulness of alcohol in moderate quantities, there is no question of its pernicious and poisonous effects when taken in excess. It then injures and degenerates all parts of the body, and produces premature old age. The lungs become prone to emphysema; there is diminution of both physical and mental vigour; the kidneys, liver, and stomach may become cirrhosed. Even when the effects of hard drinking are not very apparent in health, they become evident on the occurrence of illness or accident, when the constitution manifests its undermined condition and its diminished power to resist disease. Drunkards thus succumb to accident or illness which temperate men easily overcome.

Delirium tremens is another alcoholic disease. It may arise in different ways; sometimes being produced by a single debauch, but commonly occurring in those who habitually take an excessive quantity of wine or spirits, without perhaps ever getting drunk. In that arising from an exceptional debauch, it is merely necessary to withhold spirituous drinks for a time, to allow the system to become free from alcohol. On the other hand, delirium tremens is often excited in habitual topers by altogether withholding intoxicating drinks, so that in treating these chronic drinkers a moderate quantity of some alcoholic drink must be allowed.

The influence of alcohol on the heart is most noteworthy. It strengthens the contractions of the heart, especially when this organ is weakened by debilitating diseases, which are always attended by a quickened and weakened pulse. Owing to its tonic influence on the heart, alcohol strengthens the pulse, and reduces its frequency. It must be considered one of the most powerful cardiac tonics. This tonic property, together with its power to promote digestion by increasing the gastric juice, explains the great usefulness of alcoholic beverages both in debilitating, chronic, and acute diseases.

In most diseases accompanied by weakness or prostration, alcohol in one or other of its forms often proves a very valuable remedy. It is of conspicuous service in acute diseases running a limited and definite course, in the treatment of which the cardinal point is to sustain the vital force beyond the critical stage.

When the heart is suddenly enfeebled, from fright, loss of blood, accidents, or other causes, it is best strengthened by brandy or wine.

Great as are the beneficial effects of alcohol in disease, yet it may do harm as well as good. In its administration certain precautions must therefore be observed, and its effects on the different functions must be carefully watched. Although the heart affords the most trustworthy information on this point, yet the influence of alcohol on the other organs must not be overlooked, as it may happen that while one system is benefited another is injured, and that while alcohol does good in one respect, yet on the whole it does much harm.

The following rules, regarding the use of stimulants in fever, were laid down by Dr. Armstrong, and have been endorsed by Dr. Graves:—

1. If the tongue become more dry and baked, alcoholic stimulants generally do harm. If it become moist, they do good.
2. If the pulse become quicker, they do harm. If it become slower, they do good.
3. If the skin become hot and parched, they do harm. If it become more comfortably moist, they do good.
4. If the breathing become more hurried, they do harm. If it become more and more tranquil, they do good.

These excellent rules might be supplemented by a fifth: If alcohol produce sleep, and quell delirium, it does good.

In judging of the influence of alcohol on the pulse, its compressibility is of more importance than its volume. Under the action of alcohol a soft and yielding pulse of large volume often becomes much smaller and less compressible, changes indicating an increase in the tonicity of the arteries, and in the strength of the heart.

Such are the rules which must guide us in the employment of alcohol in disease. They give us data as to the quantity we should administer, and whether we should continue, increase, or withhold the dose.

There are other circumstances which we must carefully regard in respect of the employment of alcoholic drinks. At the two extremes of age, the powers of the body being easily depressed, stimulants are accordingly early called for, and must be freely used. In the aged, especially, it is of great importance to anticipate prostration by the early employment of alcohol; for it is very difficult to overcome this condition, and to restore the patient to his former state. Young children prostrate from disease take stimulants even in large quantities with benefit. Next, the knowledge of the course a disease usually runs, gives indications in respect of this question. In some acute diseases, as typhus, which are very liable to produce much depression, especially at the extremes of life, stimulants should be early employed.

There can be no doubt that alcohol is not required in all febrile diseases; on the contrary, many cases are best treated without it; and in no instance should it be given unless special indications arise. The enormous quantities of alcohol which used to be given a short time ago are rarely needed, although sometimes very large doses are undoubtedly the means of saving life.

The kind of alcoholic stimulant employed is not a matter of great importance, provided its quality is good. It is undesirable to give several kinds of stimulants at about the same time, or they may derange the stomach; but they may be changed from time to time, according to the patient's desire. Anstie recommends strong alcoholic drinks in fevers, as brandy in the early and middle stages; but when the heart flags, and the nervous system becomes weakened, he prefers wines containing plenty of compound ethers. Stimulants should not be given in large quantities to weakly persons at distant intervals of the day; it is far better to give it in small and frequent doses. A large dose at one time strongly stimulates the heart; then, as the alcohol is decomposed or eliminated, the heart is left unsustained, when great weakness may set in; whereas the frequent administration of smaller quantities keeps the heart more uniformly supported.

Some easily digested food, in small quantities, should be given with the stimulant, which, by promoting digestion, supports the patient's strength in the most natural and most effectual way. As a rule, where food is freely taken and digested, stimulants are little needed.

Weakly children derive more benefit by taking stimulants about an hour before rather than with food. This plan enables them to take more food, and to digest it better, than the more common one of giving the stimulant with food.

In common with ether and chloroform, alcohol is an anti-spasmodic, and may be employed in the same cases and in like manner, but ether and chloroform are more effective anti-spasmodics.

It does sometimes happen that one alcoholic stimulant is harmful, while another is found useful. This is especially noticeable in coughs, which are aggravated by porter or beer, but are unaffected or even eased by brandy or wine. Beer or stout sometimes produces sleepiness, heaviness, even headache, and flushing of the face, while the same individuals can take wine or brandy without inconvenience. Individual peculiarities in respect of the effect of wines are sometimes met with, some being unable to take sherry without suffering from acidity, while others are speedily troubled with gouty pains if they take port.

The wish of the patient for any particular form of stimulant is often a correct indication of its desirability. The urgent thirst of fever patients may often be very gratefully allayed by a free draught of the weaker beers.

Stout is very supporting and nourishing, and often useful to persons with exhausting discharges, and to women weakened by suckling. In many cases unfortunately it disagrees, producing headache and sleepiness. The good old-fashioned remedy, rum and milk taken before breakfast, is useful in phthisis and in exhausting diseases. Town-living women, who, without appetite for breakfast, suffer from morning languor and exhaustion, often lasting till mid-day, to whom dressing is a great fatigue, are greatly supported by taking rum and milk an hour before rising.

It has been suggested that if alcohol lowers the body-heat it ought to prove especially useful in fevers. The author made a large number of observations on this point, and found that as in health, so in fevers, alcohol slightly reduces the temperature; but its power in this respect is so insignificant, and doses so enormous must be taken to produce even trifling results, that it is useless to give alcohol solely with this view.

The ill effects of alcohol in gonorrhœa are well known.

CHLOROFORM.

Chloroform, when applied to the surface of the body, speedily volatilizes and cools the skin; but it is seldom used as a refrigerator, being in this respect inferior to other agents.

Owing to its high diffusion-power, it readily penetrates the animal textures. If evaporation be prevented, it penetrates the cuticle, and excites inflammation. Thus applied, chloroform is rubefacient.

Employed in quantity insufficient to excite inflammation, chloroform deadens sensation, and acts as a local anæsthetic. It is sometimes applied to relieve pain, and occasionally with good effect, although it often fails, and is inferior for this purpose to many other external applications.

It has been used in neuralgias, sometimes with success, but it generally fails, and even when successful, the relief is ordinarily very temporary, the pain soon returning.

In faceache or toothache, two or three drops on a small piece of cotton-wool, introduced into the ear, gives occasionally complete and permanent relief; but if too large a quantity is used, it will excite inflammation, even vesication, and give much annoyance to the patient. The pain of cancer, when the skin is broken, leaving a painful, irritable sore, may be much relieved by playing vapour of chloroform on the raw surface. The immunity from pain often lasts several hours. The pain of cancer of the uterus, of ulceration of the os uteri, of neuralgia of the uterus, and, in a less degree, the annoyance of pruritus pudendi, are relieved by a similar proceeding. The vapour must be made to play on the os uteri for some minutes. The author thinks that chloroform vapour might be tried in cancer of the rectum, spasms of the intestines, etc., recollecting, however, that chloroform is easily absorbed by the large intestine.

According to Sir J. Simpson, evaporating a few drops of chloroform from the palm of the hand held close to a photophobic eye, will enable it to bear the light without pain.

The itching of urticaria, lichen, and true prurigo may often be allayed by an ointment composed of half a drachm of chloroform to an ounce of lard; but, like most other ointments, it often loses its effects in a short time, hence applications to subdue itching require to be changed from time to time. Dr. Augustus Waller has shown that chloroform promotes to a considerable extent the cutaneous absorption of many substances. Thus chloroformic solutions of aconite, atropia, strychnia, or opium, applied to the skin, speedily destroy an animal with the characteristic toxic symptoms of the alkaloid employed. The absorption of watery or alcoholic solutions is far less rapid. He ascribes this property of chloroform to its power of rapidly passing through animal textures, carrying with it, in its passage, the dissolved alkaloid. The addition of a certain amount of alcohol to the chloroformic solution does not hinder the absorption of the alkaloid—indeed, it appears to hasten it; for when an equal quantity of alcohol is added to the chloroformic solution, the absorption is more rapid than when chloroform only is used. This effect of chloroform should be borne in mind when we employ alkaloids as external applications.

It produces in the mouth a sensation of warmth, and if undiluted excites inflammation. Being a stimulant to the mucous membrane, it excites a flow of saliva. A few drops on cotton-wool inserted into the hollow of a decayed aching tooth often gives permanent relief. After the anæsthetic effect has ceased, the pain is sometimes aggravated, the chloroform having irritated the inflamed pulp. It is a good plan to fold over the hollow tooth a piece of linen moistened with chloroform, so that the vapour of chloroform may remove the pain. Equal parts of chloroform and opium, or of chloroform and creasote, are a useful application in toothache.

Chloroform excites a sensation of warmth in the stomach, but in large doses it induces nausea and vomiting. Drop doses of pure chloroform will be found beneficial in flatulent distensions of the stomach, sea-sickness, and other vomitings.

By virtue of its high diffusion-power it passes rapidly into the blood, little, if any, finding its way into the intestines. The physical and chemical changes produced in the blood by its admixture with chloroform are at present unknown.

In health, when given in medicinal doses, it produces very little change either in the frequency or strength of the heart's contractions. It is said, when inhaled, judging by the hæmadynamometer, at the very first, slightly to increase their force. In disease, on the other hand, when the heart beats feebly, especially if due to some sudden and transient cause, chloroform certainly strengthens the heart's contractions, so relieving such symptoms as syncope, etc.; but it is in no way preferable to a glass of brandy and water or wine. It no doubt acts more quickly and evanescently than alcohol, and its effects on the heart certainly decline more speedily than is the case with alcohol. It is frequently administered to hysterical patients and others who suffer from weakness, depression of spirits, nervousness, etc. By habitual ingestion it soon loses its effect, as indeed is the case with all stimulants, especially with chloroform and ether, so that the dose must be increased, and even then it soon loses its efficacy.

In diarrhœa, after the irritant which caused it has been removed, spirits of chloroform, combined with astringents and opium, may be given with much benefit. It is useful in colic of the stomach or intestines, from whatever cause arising, and in renal and biliary colic, in hiccup, hysteria, and asthma, both primary and secondary. From the relief it gives in these affections, it is ranked among antispasmodics. Its mode of action is at present unknown. Possibly by restoring the weakened muscular or nervous system to its natural physical condition it controls inordinate muscular action, and removes pain, thus becoming a true stimulant. In the treatment of any of the foregoing diseases it is usually combined with opium, and this combination succeeds admirably; but much of the effect is due to the opium, its action, however, being apparently increased and sustained by the chloroform.

Chloroform, combined with small doses of morphia or opium, given with a drachm of glycerine, honey, sugar and water, or treacle and water, is often conspicuously beneficial in certain coughs. It is useful when the cough is paroxysmal and violent—violent out of proportion to the amount of expectoration; when, indeed, there appears to be much excitability or irritability in the respiratory organs, and when a slight irritation is followed by a distressing fit of coughing. In such circumstances the chloroform is of more service than the opium, and should be in a full, while the opium should be given in a very small, dose. This combination allays the cough in the fibroid form of phthisis, so frequently paroxysmal, wearing and exhausting to the patient.* Cough often arises from a morbid condition of throat; and even when due solely to disease of the lungs, the application of this mixture to the throat and parts about the glottis is often beneficial, in accordance with a general rule that organs can be influenced through the nerves by remedies applied to the orifices communicating with certain organs, as the nipple, rectum, and throat. For example, many coughs may be allayed much more efficiently if the opium and chloroform mixture is swallowed slowly, and so kept in contact with the fauces as long as possible.

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* In fibroid phthisis, the long-continued teasing cough requires another explanation, and a different treatment. In this form of lung disease there is often such

Being highly volatile, much chloroform passes off by the lungs, and its odour can be detected in the breath; some, probably for the same reason, escapes by the skin, and some probably by the urine. In its passage from the lungs it is unlikely in any way to influence the mucous membrane of the bronchial tubes, the quantity separated being very small; and even during and after inhalation of chloroform we do not observe any alteration in the secretion of this mucous membrane. Its influence, if any, on the kidneys and the urine, is at present unknown.

From Harley's observations on the action of chloroform on the respiratory function of the blood, it may perhaps be concluded that it lessens the oxidation of the blood, and diminishes the evolution of carbonic acid; but we think that further experiments are needed to establish this point.

Chloroform is of the most signal service as an anæsthetic, and we will now give a succinct and practical account of its administration.

Chloroform very often causes at first a sensation of tingling and heat in the lips and nose, and these parts, if accidentally moistened with it, may become inflamed even to blistering; an accident always to be prevented with care, particularly if the nose and lips are first smeared with glycerine or cold cream, or some protecting substance.

The early sensations experienced vary much in different persons;

extensive induration, with thickening of the pleura, as to prevent any expansion of the lung, and consequently of the chest walls, so that little or no air enters the consolidated part of the lung, and no expulsive force can be brought to bear on the mucus. Here our attention should be given to check the abundant secretion, to lessen its tenacity, and so facilitate its expulsion.

sometimes they are so agreeable as to tempt some to inhale this substance merely for the sake of producing these pleasurable sensations; but in the majority the sensations are more or less disagreeable, often intensely so.

There is at first a sensation of warmth at the pit of the stomach, spreading to the extremities, and accompanied by some excitement; then soon some or all of the following symptoms set in. Noises in the ears, lights before the eyes, great weight and oppression of the chest, great beating of the heart, throbbing in the large vessels, and a choking sensation. These symptoms betoken no danger, and need excite no apprehension. At the very commencement of the administration, it not unfrequently happens that some cough is excited, or even a passing spasm of the glottis, sure signs that the vapour is being administered in too concentrated a form, and that more air must be mixed with it, by opening the valve in Clover's apparatus, or by removing the lint farther from the nose and mouth.

At this early stage of the proceedings, women, by becoming hysterical, may give some trouble and alarm. They laugh, sob, or cry; often their breathing is extremely irregular and hurried—a condition which frightens the friends, and those inexperienced in chloroforming; but this state is to be accepted as an indication to continue the administration, not to withhold it; for as the patient passes more deeply under the power of this anæsthetic, this condition soon subsides.

The pulse at first quick, and it may be weak, if not due to the patient's illness, is the effect of nervousness and anxiety. As soon, therefore, as unconsciousness takes place, the pulse falls in frequency, and gains in force.

In a few seconds from the commencement of the administration all discomfort ceases, the patient becomes quiet, and breathes calmly. The consciousness is now more or less affected; questions are still heard, but are slowly answered, and not to the purpose. The induction of this medium stage is adequate for confinement, and for the treatment of renal colic.

Soon all knowledge of the external world is lost, and a period of excitement occurs. Various incoherent ideas occupy the mind.

Some struggle, attempt to get up, and are often much irritated when they are restrained. The stage of complete unconsciousness required for capital operations is now fast approaching. Violent tonic contraction of the muscles of the body often occur before complete unconsciousness and perfect muscular relaxation set in. The extremities become rigid; the muscles of the chest are firmly fixed, and the respiration thus becomes impeded, which, with the general violent muscular contraction, causes duskiness or lividity of the face. The eyes are injected and prominent, the lips blue, the jugulars stand out like large black cords, the mouth is clenched, and a profuse perspiration breaks out on the body, especially about the face. In a few seconds all these symptoms pass away. They may be accepted as a sure indication of the immediate approach of utter insensibility and complete flaccidity of the muscles, and as a warning that the administration must be conducted with increased caution, or the patient will suddenly pass into a stage of danger, with noisy, stertorous, quick, shallow breathing, and quick, weak pulse. These violent muscular contractions, which greatly distort the face, and frighten the patient's friends, rarely occur in women or children, or in men weakened by exhausting illness. This condition is more frequently seen when the chloroform is administered too abundantly, and the patient is brought too quickly under its influence.

As these movements cease, the muscles become flaccid, and the stage of perfect insensibility is reached. Reflex action is lost; the conjunctiva can be touched without producing winking. The limbs, when raised and let go, fall heavily. The breathing is calm, but a little superficial; the pulse is not much altered, but it may be a little more compressible. The face is moist with perspiration. The pupil is much contracted. This condition may be maintained with due precaution for a considerable time; but if now the chloroform is continued in undiminished quantity, the breathing becomes noisy and stertorous; the pupil greatly dilates; the pulse loses its strength; the breathing becomes gradually more and more shallow, and less and less frequent, till both pulse and respiration stop. Even now, if artificial respiration is performed, the breathing often recommences, the pulse is again felt at the wrist, and life is saved. On several occasions the author, while administering chloroform, has seen persons recover from this critical condition.

On the other hand, it appears that sometimes, without warning, while the pulse is beating well and the breathing is deep and quiet, the heart suddenly stops, and respiration immediately ceases. This form of death arises probably from cardiac syncope, while the other form of death is probably due to gradual paralysis of the respiratory muscles.

With care chloroform insensibility may be maintained for hours and even days.

In administering chloroform, the attention should be directed to the state of the pulse, the breathing, the conjunctiva, and the pupil. The pulse usually retains throughout its frequency and force. Should it become quick and weak, or irregular, then the inhalation must be withheld, unless the frequency of the beats can be accounted for by the patient's struggles. The breathing often affords an earlier sign of danger than the state of the pulse. If the respiration become very shallow, and gradually less frequent, the chloroform administration should be suspended for a time.

The surest signs of safety, and the earliest of danger, are afforded by the state of the conjunctiva and pupil; for while irritation of the conjunctiva causes reflex action, and is followed by blinking, there is usually no danger. Another most important point to heed is the size of the pupil. In the stages of insensibility when no danger is to be apprehended, the pupil is much contracted; but on the approach of danger from over-dose of the anæsthetic, the pupil dilates. When all reflex action is lost on touching the conjunctiva, and the limbs, when raised, fall heavily, the patient is fit to undergo any operation.

One or two circumstances require a passing notice. Vomiting is liable to happen if food has been taken a short time before the administration of chloroform, and occurs either as the patient is passing under its influence or more commonly on recovery from it, and always ceases when its full effect takes place. Vomiting, happening after the full effects of chloroform have been obtained, may be taken as a sign of returning consciousness; and if the operation is not completed, the administration should at once be continued, when the vomiting will speedily cease. But to avoid vomiting, it is advisable that no food should be taken for three or four hours before chloroformization. At the same time, too long a fast should be avoided, or its very purpose may be defeated by inducing the tendency to vomit; and fainting and much exhaustion may occur from a small loss of blood during the operation. In case of vomiting, the head should be turned aside to assist the escape of the rejected food, and to prevent choking.

It should be borne in mind that operations on the rectum and vagina, even when the patient is quite insensible, often, nay generally, cause noisy catchy breathing, very much resembling stertorous breathing, often mistaken for it, and sometimes thought to indicate that too much chloroform has been administered; but this is not the case. The true state of things can generally be discriminated by a little attention to the circumstances. Thus the noisy breathing does not occur until the rectum and vagina are manipulated, and is especially loud and noisy when the finger or an instrument is passed into either orifice with any force.

On discontinuing the administration, consciousness usually returns in a few minutes, but is sometimes delayed for a longer period. If perfect quiet is observed, its effects are often followed by sleep, which refreshes the patient, gives time for many of the disagreeable consequences of the inhalation to pass off, and allows the pain of the operation to subside.

Experiment, practice, and common sense all show that the danger of chloroform is in proportion to the per-centage of vapour inhaled in the air. The importance of ascertaining the minimum quantity sufficient to bring the patient speedily and safely to a state of insensibility is apparent. Mr. Clover has shown this to be in the proportion of 4 to 5 per cent. of chloroform vapour. It has been found that in animals killed by the inhalation of this proportion of chloroform, the heart continued to beat long after respiration had stopped.

With this per-centage, insensibility can be produced in about five minutes, with the minimum danger of incurring the serious evils of an over-dose.

At the beginning of the chloroformization Mr. Clover administers about 2 per cent. vapour, and as the patient becomes accustomed to its action he increases the quantity till 5 per cent. is reached.

The great requirement in the use of chloroform is some instrument which shall enable us to administer this substance in a known quantity. This, with other necessary conditions, the apparatus contrived by Mr. Clover fully meets.

The way in which chloroform destroys life is not yet well worked out, and much uncertainty still remains concerning its action on the heart. The sequence of events in animals killed by chloroform, when the per-centage of its vapour is not sufficiently great to destroy life at once, is as follows:—The breathing grows gradually more and more shallow and infrequent, while the pulse becomes weaker, and even ceasing; soon after breathing stops, but still, for a short time, the heart continues to beat languidly. This is the order of the toxic phenomena in animals, and that most frequently met with in the human subject. Here it is difficult to say whether the poison acts directly on the heart, and whether the enfeeblement of the heart-beats and the cessation of the pulse is due to the direct attack upon the heart, or whether it is simply connected, and depends on the gradual cessation of the breathing. It seems probable that the heart may be directly poisoned and paralysed by chloroform; for when a very large per-centage of the vapour is breathed, the heart's movements cease immediately; and further, Dr. Harley has shown that a frog's heart suspended in chloroform vapour ceases to beat much sooner than one suspended in watery vapour.[*]

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[*] Dr. Richardson describes four modes of death by chloroform.—1. By syncopal apnœa. 2. By epileptiform syncope. 3. By paralysis of the heart. 4. By depression from chloroform and surgical shock. Of the first kind he says, "Death by this mode is very rapid, occurring within the minute after the commencement of inhalation. The action of the vapour in this mode of death is by the immediate influence exerted by it on the peripheral nervous system. By this action respiration is for an interval suspended, there is accumulation of carbonic acid in the blood, irritation of the vagus, and arrest—from the irritation—of the action of the heart." Dr. Sansom rejects this explanation, and adduces experiments by Scheinesson, showing "that chloroform has equally the power of slowing the heart's action in animals, whose vagi have been previously divided. Even when the spinal chord was divided in the cervical region, as well as the vagi and sympathetic, the heart's action was enfeebled by chloroform;" an experiment showing that chloroform may affect the

The direct action of chloroform on the heart is probably displayed in those cases in the human subject, when, without warning, the patient becomes pulseless, breathless, and dies.

When any serious symptoms arise, and danger is apprehended,

heart otherwise than through these nervous channels, but by no means proving that it cannot arrest the heart through the vagi, chord, or sympathetic.

Of the second mode of death, by epileptiform syncope, Richardson says, "it occurs during the second stage of narcotism—the rigid stage, as it has been designated. In this stage the chloroform is acting as an excitant to the whole muscular system through the blood, which conveys it over the organism, and in this excitement the involuntary as well as the voluntary muscular fibres share." There is intense arterial contraction, which drives the blood from the left side of the heart and arteries into the venous system, and death from syncope ensues.

"The third mode of death is one in which, from the slow and continued action of the narcotic, there is paralysis of the heart, with apparent paralysis of the muscular system generally." Death gives warning of its approach by intermittence of of the pulse.

"The fourth mode of death is a compound death. There are in it two factors—depression from chloroform, and surgical shock. The combination may be in two or three ways. In a few instances hæmorrhage has brought to a fatal degree a depression which had commenced during and from the administration of chloroform. In other cases the patient has not been fully narcotised, and in a half-unconscious state, feeling the pain of the operation, has become faint, and died from syncope. Finally, under very deep narcotism, death may take place from severity of shock, incident to operative procedure."

Dr. Richardson thus summarises his views of death by chloroform :—"In the first stage of administration, the effect of the vapour is upon the peripheral nervous surface and the cerebral centres. In both there is excitation, and very early the cerebral centres lose their natural condition, becoming suspended in function. Following immediately upon this, the chord, the sympathetic system, and the true nervous system of the heart, become excited. Thirdly, the nervous excitation generally ceases, and there follows calmness or even depression of action; and if the administration be continued, the medulla fails, the sympathetic fails, the cardiac nervous centres fail. This then is the natural order of death of each part—brain, chord, sympathetic centres, cardiac centres.

"In all the modes of death from chloroform we see a fatal disturbance of the balance between the inhibitory action of the vagus and the motor nervous system of the heart.

"In the first mode—by syncopal apnœa—we see the direct action (inhibitory it is called) of the pneumogastric upon the heart. In the second mode—by epileptiform syncope—we see the direct effect of excitation of the centres, which supply the outer or contractile elements of the vascular system. In the third mode—by failure of muscular motion—we see the effect of the poisonous agent upon the motor system carried to paralysis; and in the fourth, when surgical shock combines with depression from chloroform, we see direct paralysing action, both on the sympathetic and pneumogastric."

the chloroform administration should, of course, be discontinued temporarily, and artificial respiration, after Sylvester's method, practised instantly and assiduously, whether the breathing has ceased or is growing slower and shallower. In most cases where the breathing has been extinguished in a gradual manner, in a few seconds after the employment of artificial respiration, provided it is instantly adopted, the patient fetches a deep gasp, which is soon repeated, and presently the breathing grows more frequent, till it becomes natural, and he is saved. Even when the chest has ceased to move, the pulse to beat, and when the patient presents all the appearances of death, life may yet generally be restored. Little is to be hoped, however, from artificial respiration in those cases where the breathing and pulse both cease immediately, and without any warning. Besides the use of artificial respiration, cold water should be dashed over the face and chest, air should be freely admitted, and all hindrance to breathing removed; indeed, everything hampering to the breathing, as stays or a tight dress, should be removed before the administration of chloroform is begun. The most serious impediment to the breathing, sufficient to endanger life, may be caused by the patient lying prone for the convenience of the operator. The author has several times witnessed cases of imminent danger from this cause. The most anxious care must be paid to the state of the breathing when this position must be assumed; for it is quite sufficient to arrest feeble breathing, which without this impediment would go on safely.

It is a question of importance whether galvanism should be used in danger from chloroform. The committee appointed by the Medical and Chirurgical Society are of opinion that this agent is useful, but that it is far inferior to artificial respiration; but some authorities are wholly opposed to its use, on the score of its influence to arrest a very feebly acting heart, and so diminishing any slight remaining hope of recovery. It is advised to apply it to the phrenic nerve, to stimulate the diaphragm to action, and thus maintain breathing till the chloroform shall have had time to evaporate from the blood, and the system become freed from its effects. But respiration can be much better maintained by artificial respiration.

It has been proved that a certain per-centage of chloroform, amply sufficient to produce, in a short time, complete unconsciousness, can be inhaled with safety for an almost indefinite time. It is therefore obvious that the method required should enable us to give with certainty as much chloroform as we may wish, so that the quantity compatible with safety shall never be exceeded. The contrivance which best fulfils this condition is the ingenious apparatus of Mr. Clover. Its advantages are so great as to outbalance fully the slight inconvenience connected with its use. If this apparatus is not at hand, the use of a simple piece of lint and a towel, or Dr. Simpson's method, may be adopted.

Are there any conditions of age or health which forbid the use of chloroform as an anæsthetic? Provided due care is observed, the author thinks it may be given to all persons, irrespective of their condition. He has given it in serious heart disease, in every stage of phthisis, in Bright's disease, cancer, chronic bronchitis, etc., to patients almost dead of exhaustion from loss of blood, to children of a few weeks, and to persons close upon a hundred years old, without any threatening symptoms. No doubt a dilated or a fatty heart adds to the patient's risk, and enforces on the operator more care and anxiety. The two extremes of age are conditions which exact close watching during its administration.

Chloroform is employed, as is well known, to obviate pain during the performance of surgical operations. For minor operations ether spray is undoubtedly to be preferred; but for the more formidable operations chloroform inhalation must be used. In addition to its more obvious advantages in operations, the employment of chloroform has been found to reduce the mortality.

Chloroform inhalation is now frequently used with much advantage during delivery. It eases the uterine pains, without increasing the danger to mother or child. It is not necessary to obtain complete unconsciousness, but to give only sufficient chloroform to dull the pains; if this recommendation is disregarded, and the anæsthetic is pushed to complete unconsciousness, it weakens the contractions of the womb, and retards delivery. It is true that the uterine contractions are probably somewhat weakened even if only slight unconsciousness is produced; but accoucheurs maintain that this disadvantage is more than compensated by the relaxation of the parts, and the abatement of spasm.

In dental operations the patient incurs some additional risk of syncope, owing to his sitting posture. Chloroform should be forbidden in dentistry. Indeed, it is now superseded by nitrous oxide.

It may be used with signal benefit in renal and biliary colic. In the author's experience it is inferior only to morphia injection, and is very far superior to opium, warm-baths, and the ordinary treatment in vogue. It removes the severe pain before unconsciousness is reached; indeed, it is never necessary to carry the administration of chloroform very far. The pain often speedily returns, but may be quelled again; and after two, at most three, administrations it is usually permanently removed.

Chloroform in the treatment of chorea is sometimes most valuable. It is especially applicable to those serious cases in which violent and constant movements prevent sleep, and even the swallowing of food, so that speedy exhaustion and death are to be apprehended. In such cases chloroform often induces a refreshing sleep; indeed, the sufferer passes from the insensibility of chloroform into that of natural sleep, and after, perhaps, some hours, wakes up soothed, refreshed, and with a marked abatement in the movements. So great sometimes is this improvement, that patients, who before the chloroform could scarcely be restrained in bed, after waking, sit up, troubled with only slight involuntary movement, and eat and swallow with ease. Soon, however, the movements return, when the inhalation must be repeated. At first it should be administered three times a day; then, proportioned to the improvement, twice; and, after a time, once a day. It is stated that this treatment will cure the disease on an average of twenty-eight days. In delirium tremens, when sleep cannot be obtained by the usual means of treatment, it has been advised to produce unconsciousness by chloroform inhalation. Chloroform will arrest convulsive fits, especially in children, sometimes permanently. Chloroform inhalation is of great service in puerperal convulsions. It is necessary in some cases to maintain unconsciousness for hours, or even days, allowing the patient to wake every three or four hours to take food.

In the reduction of hernia its use is obvious. It may be used to assist the diagnosis of abdominal tumours, when deep-seated, and when the walls of the belly are hard and rigid. It is useful also in determining the nature of phantom tumours; for these disappear entirely when the patient is made insensible by chloroform.

Chloroform inhalation gives relief in neuralgia, sciatica, colic of the intestines, if the pain is very severe, in distressing dyspœna, whether this is due to asthma or aneurisms, etc.

ETHER.

The physiological action and therapeutic use of ether and chloroform are for the most part identical.

As a local anæsthetic in neuralgia, toothache, etc., ether is less frequently used than choloroform.

In the form of spray, after the method introduced by Dr. Richardson, ether is frequently employed locally to abolish temporarily sensation of the skin; it effects this loss of sensation by rapid evaporation and great abstraction of heat, whereby the tissues become frozen and consequently non-sensitive. Ether spray is frequently used in minor operations, as the opening of abscesses, the removal of small tumours, etc. It has been successfully employed in amputation of the leg and in ovariotomy, but it is not generally available in such serious and prolonged operations. The skin or mucous membrane, when sufficiently frozen to permit of an operation without pain, becomes pale, shrunken, tallowy-looking, and feels as if oppressed with a great weight. Whilst recovering their natural condition, the frozen tissues tingle and smart, sometimes so intensely as to exceed the pain of the operation. The obvious advantage of this proceeding over inhalation of chloroform is its perfect safety.

As a general anæsthetic, ether for many years preceded chloroform; and although at the present time chloroform has almost completely superseded ether, yet each has its respective advantages. Ether differs from chloroform in several particulars. It must be inhaled in larger quantities, and for a longer time. Its effects pass off sooner, consciousness often returning almost immediately the inhalation is suspended. Ether produces much more excitement than chloroform. The committee of the Medical and Chirurgical Society, instituted to investigate the action of chloroform and ether, state that at first both strengthen the heart's contractions; soon, however, the heart grows weaker and weaker as the animal passes more deeply under the influence of chloroform; while the tonic effects of ether persist, and the heart's pulsations often continue strong till the moment of death, which in almost every instance depends on paralysis of the muscles of respiration. Thus ether and chloroform each destroy life by arresting respiration; but in regard to chloroform there is an additional danger from its depressing action on the heart. As in almost every instance chloroform produces sufficient loss of consciousness without depressing the heart, this rarely occurring unless, from careless administration, too much chloroform is inhaled, the advantage on the side of ether is practically more apparent than real.

Freezing the skin with ether spray sometimes permanently removes sciatica or neuralgia, but generally the relief is only temporary.*

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* In an interesting lecture on anæsthetics, Dr. Richardson discussed the merits of the following substances, differing only in the amount of chlorine they contain.

C	H	H	H	Cl	Chloride of methyl.
C	H	H	Cl	Cl	Bichloride of methyline.
C	H	Cl	Cl	Cl	Chloroform.
C	Cl	Cl	Cl	Cl	Tetrachloride of carbon.

"All these substances," he says, "possess the power of producing anæthesia when they are inhaled as vapour by men and animals.

"Chloride of methyl exists in all ordinary temperatures as a permanent gas. It is very soluble in ether; and when ether is saturated with it, the compound is one of the most perfect of anæsthetics. Unfortunately this compound is not very stable, the sleep produced by it is rapid, gentle, profound, and prolonged, and I found in an animal, where I may say I forced the animal to die by increasing the quantity of the vapour, that the muscular irritability was perfect one hour and five minutes after death." It is soluble in water, and water charged with it will take up four volumes. Chlor-methyl water is rather agreeable to drink, and is a potent intoxicator. Half an ounce has a very decided but transient effect.

"Bichloride of methyline is a colourless fluid, having an odour much like the

IODOFORM.

Iodoform is a healing and easing application to spreading and sloughing sores, as bed sores and soft chancres. The sore dusted over with iodoform is covered with some bland application, as glycerine spread on lint. Iodoform has been successfully employed in ulceration of the nose and throat. It relieves the pain of cancerous sores. When employed in uterine cancer, a bolus containing eight to sixteen grains made up with cocoa-nut fat is inserted into an excavation produced by sloughing or ulceration. An iodoform suppository is also useful in painful diseases of the rectum and bladder.

It is said to relieve the pain of neuralgia and gout, a saturated solution of iodoform in chloroform is advised in neuralgia.

Iodoform must not be applied to inflamed tissues, or it will increase the inflammation.

Taken internally, it produces a kind of intoxication, followed by convulsions with tetanic spasms. The breath and tissues of the animal smell of iodoform.

HYDRATE OF CHLORAL.

We owe most of our knowledge of this valuable medicine to Liebreich, whose experiments and conclusions Dr. Richardson has in the main confirmed.

Chlorine acting on alchohol ($C^2 H^6 O$) first produces aldehyde ($C^2 H^4 O$), and afterwards chloral ($C^2 H Cl^3 O$), which forms a crystalline soluble hydrate.

Liebreich believes that the alkali of the blood decomposes

odour of chloroform. It is pleasant to inhale as vapour, and produces very little irritation of the fauces and air passages. Its specific gravity is 1·344. From its position physically it combines many of the properties of chloroform with those of ether, and these peculiarities must be remembered in its administration. From its easier evaporation it requires more free administration than chloroform, and from its greater density of vapour it requires less in quantity than ether." The bichloride of methyline sometimes excites vomiting. Dr. Richardson thinks it a less dangerous anæsthetic than chloroform.

hydrate of chloral, forming chloroform, and that the properties of chloral are due to the chloroform slowly formed in the blood.

The following are Liebreich's conclusions concerning the effects of chloral :—

1. "That chloral in efficient doses produces quickly after administration deep sleep; and when carried far enough, complete anæsthesia.

2. "That the action is without excitement.

3. "That the agent leaves no bad after-effects.

4. "That the nervous power of the heart is the last that suffers."

These conclusions are for the most part confirmed by Richardson, who finds in addition that hydrate of chloral depresses the temperature of rabbits.

Dr. W. A. Hammond's observations throw some light on the way hydrate of chloral produces sleep. At first chloral congests the retina, but in five or ten minutes the opposite condition commences, and increases till the retina assumes a pale pink colour. As the retinal circulation corresponds with the cerebral, he concludes that chloral affects the brain in the same way as the retina, and has proved the correctness of this inference by means of an instrument called the cephalohæmometer invented independently by himself and by Dr. Weir Mitchel. Dr. Hammond says that while the brain is congested there is some mental excitement; but as the vessels contract, drowsiness supervenes; and on this wearing off, the retinal and cerebral vessels enlarge till they assume their accustomed size.

Liebreich asserts that strychnia is an antidote to chloral.

Hydrate of chloral is employed to produce sleep or allay pain. Chloral sleep is generally calm, refreshing, and dreamless, not too profound to prevent waking to cough, take food, etc. As a general rule, chloral causes no giddiness, headache, nervous depression, constipation, sickness, or loss of appetite. A patient roused from chloral sleep will eat a hearty meal, then lie down and immediately fall asleep again.

Chloral at first sometimes causes a good deal of heaviness and sleepiness on the following day, but this effect soon wears off. It occasionally produces frightful dreams, and sometimes much excitement, intoxication, and even delirium without sleep.*

Sleep comes on sometimes in a few minutes, but more commonly in half an hour, after a dose of chloral. Like other soporifics, it should be given shortly before bed-time. It has been given for months without any bad results. Sometimes its effects wear off, but in a far less degree than is the case with opium.

Chloral has been found useful in a variety of circumstances. It subdues the sleeplessness of old people, and the wakefulness induced by excessive mental fatigue, succeeding where opium, bromide of potassium, and other remedies have failed. In delirium tremens it produces sleep, and calms delirium; but is especially successful when administered at the onset of the symptoms, often averting a serious illness. Large doses, even sixty grains or more, repeated several times, have been given. Dr. Da Costa cautions against its administration to patients with weak heart. He advises its combination with opium. In paralysis of the insane, full doses induce sleep at night, and moderate dose calms excitement by day. Dr. Macleod avers that it is superior to digitalis or the hypodermic injection of morphia. He has given it daily to the same patient, without bad effects, for upwards of three months. Luke, Clouston, Gardiner Hill, G. Crawford, recommend it in acute mania.

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* Dr. Reynolds narrates the following case. Similar effects have been witnessed by others. "After a dose of fifty grains, in the course of an hour some 'faintness' was felt; and when I saw the patient, this had increased to an alarming degree. Two hours had passed since the medicine was taken, and I found the patient with cold extremities; an excessively rapid, weak, irregular, and intermittent pulse; jactitation of limbs; an intolerable sense of sinking, and oppression at the pit of the stomach; gasping breathing, and confusion of thought.

"I observed at this time, and for three-quarters of an hour subsequently, that the radial, temporal, and tibial pulses were all of the character I now describe—frequent, weak, irregular, in both force and rhythm, and frequently intermittent—but that the heart was acting regularly, although with increased frequency and diminished force.

"Stimulants, with white of egg, were administered freely, warmth was applied to the extremities, sinapisms were put on the cardiac region, fresh air was introduced plentifully into the room, and at the end of an hour from my first seeing the patient the pulse had become much steadier, though still very frequent and very weak. The syncopal feeling had diminished, the feet were warm, and there was a tendency to sleep.

"This state of comparative freedom from urgently dangerous symptoms lasted for longer than an hour, when, without any apparent cause, they returned with increased severity. The patient now seemed in the gravest danger. The superficial pulses were almost imperceptible; and when they could be detected, presented the character I have described. Still the heart was regular in its beat, although feeble and intensely rapid in its pulsations. The mind wandered much; there was utter prostration of muscular strength, the limbs being extended, the head low, and the aspect was at times that of impending dissolution. There was great dyspnœa, a sense of suffocating oppression at the base of the chest (in front), and urgent thirst.

"The treatment previously adopted was again pushed vigorously, and at the end of an hour and a half relief was obtained, and sleep followed. The next morning I found the pulse quite regular, and of its normal frequency."

It is employed in puerperal mania and in puerperal convulsions, (Hay, Adams, Teller.) It is conveniently administered to the insane in porter.

Dr. James B. Russell, of Glasgow, recommends it in typhus, to produce sleep, and allay excitement. He finds it most useful in violent boisterous delirium. Dr. Russell much prefers it to opium, as the patient can be roused to take food, and readily wakes to clear the bronchial tubes, hence there is much less danger of congestion of the lungs. He states that it is a much more certain hypnotic than bromide of potassium.

Dr. Hughes Bennett finds it useful in phthisis, stating that it produces sleep, allays cough, and sometimes checks sweating, without producing any of the harmful effects of opium.

Chloral is said to be useful in tetanus. Chloral sometimes restrains the involuntary movements of chorea, but in many cases it is powerless in this respect. It is most useful in those cases where the violent movements render sleep impracticable, the want of sleep, in its turn, aggravating the choreic movement till even deglutition may become almost impossible. In these urgent cases ordinary remedies like arsenic are useless, and recourse must be had to narcotics. Large doses of chloral, frequently repeated, will often produce profound refreshing sleep, from which the patient wakes calmed and less convulsed. (*Vide* Chloroform.)

E. Lambert recommends chloral in parturition. He administers fifteen grains every quarter of an hour till the patient falls asleep. This treatment, he states, does not weaken the uterine contractions, while it prevents pain, and insures calm repose after delivery.

The shortness of breath affecting emphysematous persons on catching cold often yields to chloral. When the dyspnœa occurs at night, a full dose (twenty-five to thirty grains) at bed-time calms the breathing, and gives sound refreshing sleep. When the difficulty of breathing is continuous, small doses (two to six grains) should be given several times daily.

The statements concerning the property of chloral to allay pain are conflicting, some asserting that it produces anæsthesia, while Demarquay states that in many instances it excites hyperæsthesia. It is said that chloral simply makes a patient oblivious of pain; but if the pain is too severe to permit of sleep, chloral fails to give relief. This metaphysical explanation is certainly incorrect. The truth is, that, for some unexplained reason, chloral in some cases subdues pain, while in other cases apparently similar it fails. Chloral sometimes relieves the pain of neuralgia, chronic rheumatism, gall stones, colic, gastralgia. In doses of ten grains, three times a day, it has, in two recorded cases, relieved most severe pain of cancer, without producing drowsiness. It has been employed hypodermically, but like chloroform it is liable to excite inflammation, and to produce an abscess followed by a scar.

Valuable as chloral undoubtedly is, it has scarcely sustained its early reputation. It is not so certain a hypnotic as the first overdrawn accounts of its virtues led us to believe. Not unfrequently it produces great excitement, even intoxication, without inducing sleep. It is not uncommon to meet with a patient who has hitherto taken chloral with perfect success, yet, on the occurrence of an acute illness, not only has it failed to induce sleep, but, on the other hand, has made him restless, even delirious, with a parched, dry skin. Yet with all its drawbacks it is a most valuable remedy.

CAMPHOR.

CAMPHOR is solid at the temperature of the body, but it slowly volatilizes even at a lower temperature. But little soluble in water, it freely dissolves in oils and alcohol. Camphor destroys most plants, except those of the lowest organization, as the fungus commonly called mould. It is said to be poisonous to fleas, bugs, spiders, and other insects. Camphor excites redness and heat, indeed, slight inflammation in the unbroken skin, and of course irritates more powerfully wounds and delicate structures like mucous membranes, and may produce, not only active inflammation, but even sloughs and ulcers. Camphor has been applied to stimulate indolent sores. It is a useful addition to dusting powders to allay the heat, tingling, and itching of eczema and intertrigo. Camphor is a common ingredient of tooth powders, and is used as a corrective of foul breath.

Inhaled or taken by the stomach, camphor exerts a decided influence on "cold in the head;" employed at the beginning of an attack, camphor sometimes arrests an ordinary cold, and failing this, it abates its violence, obviating or lessening frontal headache, and lessening the sneezing and running at the nose. Camphor is useless if the first stage of the disease is past.

Camphor inhalations are sometimes useful in that troublesome and chronic complaint characterized by attacks of incessant sneezing and profuse watery running at the eyes and nose, the patient remaining well in the intervals of the seizures. These attacks may occur daily, beginning early in the morning, and may last for a few minutes only, or persist for several hours; and they may occur at any hour of the day, recurring several times daily. Sometimes several days intervene between the attacks, which may last twenty-four hours or even longer. They are generally accompanied by severe frontal headache, and in some instances are preceded by itching of a point inside the nose a short time before the attacks. This affection lasts for years.

In catarrh and this unnamed affection the patient should either sniff up finely powdered camphor, or inhale by the nose some of the alcoholic solution poured on a handkerchief or into boiling water. When boiling water is used, it is needful to protect the eyes from the camphor vapour, to obviate smarting and inflammation. At the same time he should take four to six drops of the alcoholic solution of camphor every fifteen minutes for the first hour, and hourly afterwards.

Camphor excites in the mouth and stomach a sensation of coldness, soon followed by a sensation of warmth. Large doses excite epigastric pain, nausea, and vomiting. After death from poisonous doses, the stomach and intestines are reddened and sometimes even ulcerated, the amount of mischief depending on the mode of taking the camphor, which if swallowed in solution quickly passes into the blood, the stomach being but little affected; but if swallowed in the solid form, owing to its high melting point, it remains long enough in the stomach to excite severe inflammation, and most of it escapes undissolved with the motions.

Few if any remedies are comparable to camphor in summer diarrhœa and cholera. Its benign influence in cholera is most conspicuous; for it generally checks the vomiting and diarrhœa immediately, prevents cramps, and restores warmth to the extremities. It must be given at the very commencement of the disease, and must be administered frequently, otherwise it is useless. Four to six drops must be given every ten minutes till the symptoms abate, and hourly afterwards. It is a good plan to mix it with a little brandy, but it acts admirably alone.

Dr. George Bird employs camphor with good results in the diarrhœa of infants. He administers it in milk. Camphor generally restrains the diarrhœa excited by the effluvia of drains. Some persons, especially women, on exposure to cold suffer from diarrhœa accompanied with severe cutting pains. Standing on cold objects is especially liable to excite this diarrhœa. The pain may be very severe, continuing till the bowels have acted three or four times. Camphor generally relieves the pain, and restrains this form of diarrhœa.

Camphor readily passes into the blood, and manifests itself there and in most of the organs of the body by its odour. Its influence on the blood is unknown. Its influence on the heart appears to be capricious. Large doses often slacken, but sometimes quicken, and generally weaken, the pulse. Moderate doses, it is said, quicken and strengthen the pulse.

Large doses sometimes disturb the brain, causing at first increased activity with a rapid flow of pleasant ideas; but subsequently, and in some cases even at first, it produces great faintness, giddiness, noises in the ears, much delirium, and even convulsions, with coldness of the surface, shrunk features, and clamminess of the skin. After large doses there is often some smarting and pain of the urinary organs, with urgent desire to pass water.

It is mainly used in adynamic fevers, in which, according to Graves and others, it is very valuable. It is said to strengthen while reducing the frequency of the pulse, moistening the skin, and removing the delirium, especially when of a low and muttering character. To control delirium it must be given in considerable quantity, to the extent of twenty grains or more every two or three hours, and its effects must be watched. Some practical authorities, however, deny the efficiency of camphor in the delirium of fevers.

It has also been recommended in melancholia, in spasmodic affections, in nervous palpitation, and hiccup.

It is reputed on high authority that camphor, given in considerable doses, will control inordinate sexual desire. It is said to relieve strangury. Drachm doses of the spirit relieve chordee.

Camphor is eliminated by the breath, probably with the perspiration, and a small proportion with the urine. From the irritation it produces in the urinary mucous membrane, and the small amount separated by the urine, it has been assumed that some of the products of its decomposition in the body escape with that secretion, irritating the mucous membrane over which this passes; but on this point nothing definite is known, and at present there is no proof that camphor is consumed in the body.

TURPENTINE.

TURPENTINE applied to the skin excites a sensation of warmth, with some redness; and if the application is sustained, blistering takes place. It is in common use as a rubefacient and counter-irritant. Over a flannel wrung out in hot water some turpentine or turpentine liniment may be sprinkled, and applied till it produces redness, tingling, and smarting. It is well to bear in mind that as the smarting arising from the application of a turpentine stupe goes an augmenting for some time after its removal, it should not be kept on longer than just sufficient to excite a moderate degree of pain. An equal quantity of yolk of egg and turpentine is a useful form; this mixture should be dabbed on the skin with a piece of sponge. As a rubefacient, turpentine stupes may be employed for the same purposes as a mustard poultice.

Turpentine in the stomach excites a sensation of warmth, and sometimes large doses produce nausea and vomiting. It generally acts as a purgative, but not invariably; and if, after large doses, purgation does not take place, serious symptoms sometimes arise from the absorption of the turpentine, and from its action on the organs at a distance from the intestinal canal. Thus, when administered in considerable doses, it is desirable to give, either simultaneously or soon afterwards, some more active and certain purgative, as castor oil. Even after large doses, the stomach and intestines of animals have been found free from inflammation.

This drug is successful as a tape-worm poison, but it has now given place to other milder and more efficient remedies.

Turpentine may be used to destroy thread-worms, by injection into the rectum. Many other substances are just as good vermicides.

Few remedies are more successful in staying hæmorrhage from the stomach, arising from chronic ulcer or other causes, from the intestines in typhoid, etc., than turpentine given in small doses of five to ten drops, very frequently repeated. Later on we shall speak of the use of turpentine in controlling hæmorrhages from other organs.

Turpentine proves useful in certain states of typhoid fever, probably from its direct action on the intestinal mucous coat. Thus Dr. Wood has drawn attention to its value in ten-minim doses repeated every two hours, when the tongue parts with its fur in flakes, and instead of becoming and remaining moist, looks dry and glazed. This condition is usually seen towards the end of the disease, and is accompanied always by an increase of the tympanites, and an aggravation of the other symptoms. In "the course of twenty-four or at most forty-eight hours some amelioration of the symptoms may be observed. The tongue becomes gradually moister, and covers itself with a whitish fur; the tympanitic distension ceases to augment, and after a time diminishes; the pulse becomes less frequent, and the skin less dry and harsh, and the patient enters slowly but regularly into convalescence often without any other remedy. As the case improves, the quantity of the oil should be diminished, but care should be taken not to omit it too hastily." Dr. Wood further says, "I will repeat, that oil of turpentine may be used, with great hope of benefit, in any case of enteric fever in the advanced stage, with a dry tongue."

It was employed by Dr. Graves in the same disease, in drachm doses every six hours in extreme tympanites. He pointed out that the remedy is of no use if, before and during the production of the flatulent distension, there is diarrhœa, when acetate of lead is invaluable. With the tympanites there is very often much prostration, with muscular tremblings, and picking of the bed-clothes, and low, muttering delirium, all of which symptoms, according to Graves, are, in many cases, benefited by the use of turpentine.

Turpentine passes readily into the blood, and may be detected in the breath and sweat, and in an altered state in the urine, to which excretion it gives an odour of violets or of mignonette.

When turpentine is taken in large quantities, and especially if it fail to purge, and thus escapes soon by the rectum, it produces in most persons some excitement, with giddiness, confusion of sight, quickened pulse, and, in extreme cases, insensibility, with dilated pupils. In many instances it produces bloody and scanty urine; or, indeed, it may suppress this secretion. Occasionally it excites pain along the urinary tract, with frequent and painful micturition.

As we have said, it is very efficacious in bleeding from the various organs of the body, as from the lungs, nose, uterus, kidneys, and bladder. Drachm doses should be given every three hours: sometimes these doses cause sickness and diarrhœa, and even blood in the urine; but on discontinuing the drug the blood soon disappears. Given to check bleeding from the kidneys, as in Bright's disease, it must be administered in small quantities. It is also reputed to possess the power of checking bleeding in the hæmorrhagic diathesis, and to be useful in purpura.

Puerperal fever has been treated with large doses of this medicine, but authorities are divided as to its usefulness.

It has been employed, according to some, with great success in sciatica, in half-ounce doses, given for four or eight successive nights, when, if it give no relief, it may be pronounced without influence on that particular case.

Turpentine is reputed to be diuretic, and is sometimes administered in small doses with this intent in Bright's disease.

It has been used in chronic cystitis, in gonorrhœa, and in gleet.

It has been given, with apparent advantage, in biliary colic.

Group containing—

NUTMEGS.
CLOVES.
CANELLA BARK.
CINNAMON BARK.
CAJEPUT OIL.
OIL OF ANISE.
FENNEL FRUIT.
CARAWAY FRUIT.
CORIANDER FRUIT.
DILL FRUIT.
ELDER FLOWERS.
LAVENDER OIL.
OIL OF ROSEMARY.
OIL OF PEPPERMINT.
OIL OF SPEARMINT.
OIL OF RUE.
OIL OF LEMONS.
CUBEBS.
BUCHU LEAVES.
BALSAM OF TOLU.
BALSAM OF PERU.
COPAIBA.
MEZEREON.
SASSAFRAS.
STORAX.
JUNIPER, etc.

THIS group consists of volatile oils, or substances containing volatile oils. Some of the members containing a bitter constituent are tonics.

The ethereal oils penetrate the cuticle, and excite slight inflammation. Some of them have been employed as rubefacients to rheumatic and gouty joints, to the face in toothache, etc., but they are in no way superior to turpentine and other "counter-irritants."

Balsam of Peru is a useful adjunct to ointments for broken chilblains.

All the essential oils destroy lice, whether situated on the head, trunk, or pubis. Oil of rosemary and powdered pyrethrum are generally preferred in "louse-disease."

Many excellent authorities highly praise storax and Peruvian balsam in itch. The following preparations are very useful:—Storax, an ounce; olive oil, two drachms. Or rectified spirit, two drachms; storax, an ounce; olive oil, a drachm; the first two ingredients are mixed together, and afterwards the olive oil is added to them. The whole body, except the head, is carefully rubbed with either of these compounds. It is said that one application kills the insects; but, to avoid the risk of failure, it is better to employ a second application in twelve or twenty-four hours. Although not necessary to the success of this treatment, yet, for the sake of cleanliness, a warm bath should be given before this treatment is begun, and when it is concluded. These applications do not produce any irritation of the skin, and they possess the additional advantage of an agreeable smell.

Dr. McCall Anderson highly praises storax. He asserts that it is as certain as sulphur, while, unlike sulphur, it soothes instead of irritates the skin.

The members of this group have a warm and, many of them, an agreeable taste. Oil of peppermint, orange-flower water, oil of cinnamon, oil of lemons, are used to conceal the flavour of disagreeable medicines.

These oils excite a sensation of warmth in the stomach; some of them are used to increase appetite and digestion. In large doses they excite slight inflammation of the stomach and intestines. Many of them, as oil of cloves, oil of cinnamon, oil of anise, oil of fennel, oil of coriander, oil of caraway, oil of peppermint, are employed to prevent the griping pains of purgative medicines.

Some of these substances, as cloves and cinnamon, are useful adjuncts to astringents to check diarrhœa. By their stimulant action on the muscular coat of the stomach and intestines, they remove colic, and expel wind; oil of cajeput and oil of cloves are generally preferred in flatulence. Spirit of horseradish, in half-drachm to drachm doses, is highly praised in flatulence.

These oils probably pass readily into the blood, and for the most part act like turpentine. Many of them have been employed as antispasmodics, but they are inferior to chloroform and ether. Whether they suffer any changes in the blood is at present unknown.

Balsam of Tolu, and balsam of Peru, and copaiba, are given in chronic bronchitis, with a copious secretion of pus.

Mezereon and sassafras are reputed to be useful in syphilis and chronic rheumatism.

Lavender, rosemary, rue, cinnamon, and some other members of this group, are given as stimulants to nervous and hysterical persons, to remove depression of spirits and other symptoms. They soon, however, lose their effects, unless given in increased doses.

These oils, and the resins derived from them, escape from the body in part with the breath and perspiration, but chiefly with the urine, and in their passage along the urinary tract they stimulate or irritate its mucous membrane. Copaiba is said to have caused bloody urine, with strangury and pain in the bladder.

Copaiba, cubebs, and especially buchu, are commonly used in chronic inflammation of the bladder and urethra.

Copaiba and cubebs are used in gonorrhœa and gleet. Copaiba benefits, it is said, the chronic, but aggravates the acute stages of gonorrhœa; while cubebs, which must be given in large doses, is considered only useful at the commencement of an attack. Copaiba has been used, especially for women, as an injection for gonorrhœa.

Copaiba occasionally produces a rash, sometimes like urticaria, sometimes very closely simulating the papules of measles; but with copaiba-rash there is no fever; the papules last many days if the medicine is continued, and the rash does not begin on the face, then spreading downwards over the body, but is patchy, and shows a preference for the neighbourhood of joints. In doubtful cases, where patients deny that they have taken copaiba, it may be detected in the urine by the smell, and with still greater certainty by chemical reagents; for, if copaiba is present, nitric acid makes the urine turbid, and this turbidity is dissolved by heat. Copaiba may also be extracted from the urine by shaking it up with ether.

Oil of sandal-wood, in doses of fifteen minims three times a day, is strongly recommended in acute and chronic gonorrhœa.

Probably most of these ethereal oils escape from the body with the urine; but from Weikart's experiments, quoted by Parkes, this does not appear to be the case with copaiba, whose volatile oil is destroyed in the body, and only its resinous acid appears in the urine.

Many persons highly esteem juniper as a diuretic in scarlatinal dropsy.

VALERIAN.
VALERIANATE OF ZINC.
VALERIANATE OF QUININE.
VALERIANATE OF AMMONIA.

LIKE turpentine and the volatile oils, valerian produces a sensation of warmth in the stomach, a quickened pulse, some mental excitement, and, after a large dose, even delirium.

Neligan considers valerian a powerful anthelmintic, and especially recommends it when the worms excite convulsions.

Valerianate of zinc is useful for those numerous, distressing, and changeable symptoms, included under hysteria, most often occurring in women at the time the catamenia cease. Thus it often removes "flushings of the face," "hot and cold perspirations," restlessness, nervousness, depression of spirits, feeling of suffocation in the throat, throbbing of the temples, fluttering at the heart. In many instances, these symptoms depend on uterine derangements, piles, dyspepsia, or constipation; but it not uncommonly happens that, after the removal of all discoverable disease, or in cases where no cause for the symptoms can be found, valerianate of zinc proves of great service. Oxide of zinc does good, but is certainly inferior to the valerianate. In many instances, however, valerianate of zinc fails in the very cases we should expect it to be useful. At present our knowledge of the conditions indicating the employment of these medicines is not sufficiently precise to enable us to predict, with certainty, that good will follow their employment.

Some prefer valerian or its tincture, and ascribe most of their efficacy to the volatile oil they contain. Other authorities prefer the salts of valerianic acid.

Valerian has been used with occasional advantage in epilepsy; whether the cases it benefited were true epilepsy, or merely the hysterical form of the disease, it is impossible to decide.

Valerianate of zinc, or valerianate of ammonia, in twenty-grain doses, sometimes relieves neuralgia of the face or head. Preparations of valerian are stated to control the paroxysms of whooping cough, and the involuntary movements of chorea. Large and increasing doses of valerian are said to be useful in diabetes insipidus.

SAVINE.

Savine is an irritant, and excites inflammation in the tissues. It is sometimes used to keep blistered surfaces open and discharging.

It is employed both in menorrhagia and amenorrhœa due to a want of tone in the uterus. It is used by ignorant people to produce abortion.

ASSAFŒTIDA.
AMMONIACUM.
GALBANUM.

These medicines act very similarly on the body; but assafœtida, probably from its containing most volatile oil, is the most powerful of the three.

Assafœtida has a warm taste; it stimulates the stomach and intestines, and expels wind. In large doses it often excites nausea and vomiting. It increases the secretion from the mucous membrane of the intestines, and hence acts as a mild purgative. Probably the active principle of these drugs does not pass quickly into the blood; for it makes the eructations offensive for twenty-four hours, or longer.

They generally quicken, but sometimes slacken, the pulse. After a full dose of assafœtida there occurs general exhilaration, and sometimes "various nervous or hysterical phenomena, and a general sense of *malaise*" (Jörg, quoted by Stillé). It often produces headache and giddiness. It is said to increase the bronchial secretion and perspiration. All persons, however, are not thus affected, as Pidoux took enormous doses of assafœtida, and experienced no inconvenience, except from the offensive smell of his excretions.

Assafœtida is very useful in hysteria, in many cases removing hysterical headache and peculiar sensations in the head. It is also useful in hysterical flatulence.

Assafœtida is useful in the flatulence of young children, unconnected with constipation or diarrhœa. A tea-spoonful every hour of a mixture containing a drachm of the tincture to half a pint of water, is strong enough to speedily relieve distension, and is readily taken by children. When the flatulence is due to constipation or diarrhœa, assafœtida will do very little good.

Assafœtida has been recommended in asthma, and all members of this group are useful in chronic bronchitis, with much wheezing and abundant discharge, symptoms commonly met with in elderly people. Ammoniacum is generally preferred to assafœtida.

ON CANTHARIDES, BLISTERS, AND COUNTER-IRRITATION.

The preparations of cantharides are chiefly used as rubefacients or vesicants, to control disease in neighbouring or distant parts.

That impressions made on the skin do affect deep-seated and even distant parts, is proved by the following facts:—

Dr. Inman and others have shown that blisters and other counter-irritants, applied to the chest or abdomen, excite in many instances inflammation of the corresponding part of the pleura or peritoneum. An irritant applied to a knee distended by synovitis or rheumatism, increases the distension for a day or two.

Inflammation may spread from one part to another by mere contact, as is well exemplified in that form of ulcerative stomatitis affecting the edges of the gums; the cheek and tongue opposed to the inflamed and ulcerated gum becoming in many instances inflamed and ulcerated. Similar extension of inflammation and ulceration by mere contact is witnessed in the spread of non-specific sores from the glans to the prepuce, or *vice versâ*.

Brown-Séquard states that on immersing one hand in cold water, the temperature of the other becomes depressed, and that on irritating the skin over the kidneys, the renal arteries contract.

A local irritation will produce neuralgic pains at a distance from the point of irritation, as is well exemplified in neuralgia of the different branches of the fifth nerve from a diseased tooth. Indeed, there are cases on record, where irritation of one nerve has excited neuralgia in another nerve anatomically unrelated to it; for instance, injury to the ulnar nerve has produced neuralgia of the fifth. Various serious nutritive changes may take place over the secondary seat of pain, the implicated tissues becoming red, swollen, very tender, and even indurated. Neuralgia of the temple often turns the hair of the temple rapidly grey. Neuralgia of the eye leads to serious inflammation, sometimes even ulceration, of that organ. Secretion, too, may become modified; thus each paroxysm of pain may increase, diminish, or alter the salivary or lachrymal secretions. In these instances of a local irritation producing serious alterations of nutrition at a distant part, how are these changes effected? Where there is continuity of texture between irritated skin and the part secondarily affected, as in the case of inflammation of the pleura or peritoneum, induced by blistering the chest or abdomen, there may be either simply an extension of the inflammation through the chest or abdominal walls, or, as Dr. Inman suggests, the irritant itself may permeate and inflame the tissues, and affect the deeper parts in the same manner as the skin. Where there is no textural communication between the irritated skin and secondarily affected part, the influence must travel through the nervous system.

When applied to the surface of the body, cantharides soon excites tingling, smarting, and a sensation of heat. The papillæ of the skin shortly become reddened and raised; next, in a variable time, determined by the strength of the application, on these papular elevations minute vesicles form, which gradually enlarge, and by their lateral extension soon coalesce, so that blebs of different sizes are produced. These vesicles and blebs are filled with a fluid rich in albumen, and generally contain some fibrin.

In employing these applications, it is of great importance to recollect that their effects on the body are very different when extensive vesication is produced than when their effects are limited to the production of redness, with the formation of a few small miliary vesicles. The different and even opposite effect of blisters, according to the degree of their action, has been well insisted on by the late Dr. Graves. Their first action is that of a stimulant to the body generally, and to the individual organs in whose neighbourhood they are applied. But if allowed to remain on the skin long enough to produce much vesication, and to form large blebs, they depress the bodily powers by acting as depletives in proportion to the amount of serum withdrawn from the vessels, and so lost to the system. As the serum of blisters contains almost as much albumen as the blood itself, we might indeed as well bleed the patient to the same amount. This depressing effect is often witnessed in weakly people, who, considerably depressed by the loss of serum, often remain so for several days.

Should it be held desirable to reduce somewhat the strength of the patient, and at the same time to produce a counter-irritant effect on any of the individual organs or tissues of the body, then a blister may be applied, even to vesication. As the good effects of blistering are for the most part insured by a milder application, such energetic and depressing treatment is seldom called for.

Dr. Graves commonly employed blisters as a general stimulant in the following critical condition : In acute diseases, as the idiopathic fevers and inflammations, it not unfrequently happens that the danger to a patient already much prostrated, is increased by falling into an apathetic and unobservant state, which goes on till it reaches even partial insensibility or coma, so that he can be roused only with difficulty, and then wears a stunned, stupid, and vacant aspect, and understands very imperfectly what is said to him. With this depressed condition of the mind the body generally sympathises, its functions becoming more and more languidly performed, till those necessary to life altogether cease. It is a condition which may not inaptly be compared to that produced by opium poisoning, where there is partial coma, which produces a lethargy in the functions of the body, their activity growing less as the coma continues and deepens. But with a patient in the partially comatose state of which we are speaking, there is no true and refreshing sleep. This, indeed, is a condition in which sleep is urgently needed, and an opiate and plenty of stimulants, carefully given, often produce a refreshing slumber, out of which the patient wakes strengthened and much improved. (See Opium.) If the functions are very languidly performed, then this blister treatment may well precede the use of opium.

In such a precarious condition it is of all things necessary to rouse the patient from his state of lethargy. As soon as this is effected, the functions of the body act with renewed vigour, and he passes from imminent danger to comparative safety. Blisters or mustard poultices of large size should be applied in quick succession for a short time to different parts of the body; for instance, to the chest, the abdomen, and to the thighs and calves. The great value of flying blisters in these circumstances will be the better appreciated if we bear in mind that the critical condition just described generally occurs near the end of an acute illness, when, if the patient can be kept alive for one or two days, the danger of death is nearly passed away, acute diseases having a definite duration, so that if life can be sustained to this point the patient is safe. By rousing the patient, and spurring the flagging vitality, blisters not uncommonly save an almost hopeless life.

Preparations of cantharides may be applied as stimulants of special parts of the body; for instance, when, with a general condition like that just described, there is fear of hypostatic congestion of the lungs, and of pneumonia, in which such congestion often ends, flying blisters applied to the chest, and perhaps, as recommended by Dr. Graves, along the course of the pneumogastric nerves, may brace up the vessels, and avert a serious and often fatal complication. Or we may stimulate the heart, and in intense weakness strengthen its contractions for a short time, by flying blisters or weak mustard poultices placed over the precordial region, and maintain the advantage thus temporarily produced by free administration of alcoholic drinks.

Flying blisters are largely employed in various diseases of the deep-seated organs, as pleurisy, pneumonia, asthma, biliary and renal colic, etc.

Blisters are frequently employed in pneumonia and pleurisy. Yet there exists among members of the profession great divergence of opinion as regards not only the stage of the disease in which they are useful, but even as to their utility at all. Some maintain that during the febrile stage of these diseases blisters increase the fever, and this is held to be sufficient to forbid their use. If blistering augment the fever, the increase is certainly very slight; for the author has not been able to excite fever by blisters in fever-free persons, nor has he ever seen them increase an already existing fever. The advocates of blistering in pneumonia maintain that it removes the pain, quiets the cough, and lessens the expectoration. It must be remembered, however, that many competent authorities discredit the efficacy of blistering in pneumonia.

Whatever doubt may exist as to the influence of blistering in acute pneumonia and pleurisy, most observers agree that they lessen the pain, and must therefore benefit the patient by removing the restlessness and oppression consequent on pain, and so permitting sleep. But in estimating the effect of blistering, it must be recollected that in these acute affections the severe pain is of short duration, and spontaneously lessens or disappears in about forty-eight hours. It is, perhaps, not superfluous to re-caution against too free vesication.

Opinion is more agreed on the usefulness of counter-irritation in pleurisy, after the subsidence of inflammation and fever. If at this stage flying blisters are promptly applied, of large size, often repeated and quickly healed, they further the absorption of the fluid in the pleural cavity, and lessen the risk of the disease remaining indefinitely chronic. The counter-irritation, we have said, should be frequently applied, and the vesication, should it occur, healed at once; for all the good of counter-irritation is effected during the first few hours while it stimulates the skin. The hope sometimes entertained, that, by free vesication and the maintenance of the discharge by irritating ointments, the fluid may be, as it were, drained off from the loaded pleura, is altogether fallacious. Such treatment drains from the system important nutritive material, thus weakening the patient when strength is most needed. We have already referred to the fact that blisters will redden and even inflame the pleura.

Many consider counter-irritation worse than useless when the pleural effusion has lasted a long time. This is no doubt true if a free discharge of serum is produced; but, although the long continuance of the effusion greatly lessens the chance of improvement by any treatment, yet mild flying blisters will in some cases conduce to the absorption of the fluid. If in no other way, such applications may prove serviceable by removing the troublesome intercostal pains often accompanying chronic pleurisy; but here a mustard poultice is to be preferred to a blister.

Counter-irritants are often of signal service in removing the oppression of the breathing in asthma. They relieve the pains arising from the passage of renal and biliary calculi.

Counter-irritation is useful in many other diseases, as phthisis, phlebitis, sciatica, facial paralysis, gleet, leucorrhœa, rheumatism, gout, and pleurodynia.

In certain forms of phthisis, counter-irritation proves of the greatest benefit. In the acute and rapid forms of this disease it is of little other service than to remove pain. But when the disease is chronic, when we have to treat what is now called the fibroid lung, when the cough is paroxysmal and violent, or frequent and distressing, preventing in either case rest and sleep, great benefit follows the use of active counter-irritation of the chest corresponding to the seat of the disease. It often quickly quiets the cough, greatly diminishes the profuse expectoration, and so obviates a severe drain on the strength. In blistering such patients, it is necessary to avoid vesication, or the exhaustion produced by the loss of serum may be so great as even to endanger life.

In phlebitis of the superficial veins a blister applied over the course of the inflamed vein reduces the inflammation, hastens absorption or liquefaction of the coagulated blood, and so assists the restoration of the circulation through the obstructed vessel.

Blistering surpasses all other treatment in neuralgia. A flying blister to the temple or behind the ear generally relieves frontal or facial neuralgia. That obstinate form of facial neuralgia, dependent on a diseased tooth, rebellious to all treatment except the extraction of the offending tooth, often yields to blisters; the neuralgic pains ceasing, although the toothache may continue.

Blisters relieve the shifting neuralgic pains common in nervous sensitive women, although the pain is apt soon to fix upon another nerve; but flying blisters will drive it from place to place. The obstinate intercostal neuralgia left by shingles, and occurring mostly in old people, generally yields to blisters. Anstie points out that blisters applied over the seat of pain aggravate the pain; "but, on the other hand, if they are applied to a posterior branch of the spinal nerve trunk from which the painful nerve issues, a reflex effect is often produced of the most beneficial character."

Blistering paper, although mild in its action, requiring some hours' application, generally produces enough irritation to relieve facial and frontal neuralgia; but if the pain continue unabated, a stronger preparation of cantharides should be tried.

Blisters are of the greatest service in sciatica.* They should be applied every day or second day in the neighbourhood of the sciatic nerve, reaching in severe cases from the buttock to the knee. Free vesication sometimes succeeds, where slight vesication has failed. Other counter-irritants, as mustard poultices, croton-oil liniment, iodine paint, are useful in neuralgias; but cantharides is superior to them all.

Blisters behind the ear, and especially to the temple, are very useful in rheumatic, gouty, and simple inflammation of the eye; relieving pain quickly, and subduing inflammation, but less rapidly. As it is important to repeat the application frequently, blistering paper is preferable to stronger preparations. Obstinate forms of tinea tarsi sometimes yield to repeated applications of flying blisters to the temples. Counter-irritation, by blistering fluid or croton-oil liniment behind the ear, often removes earache.

Pain and obstinate vomiting, due to disease of the stomach, are often allayed by counter-irritation at the epigastrium.

Dr. McCall Anderson recommends blistering in erythematous lupus, and in chronic skin affections, especially in eczema of the hands, when the tissues are thickened and cracked, thereby hindering free movement.

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* The most obstinate forms of sciatica are often benefited by the insertion of a needle for an inch or more in one or two places along the course of the sciatic nerve. More relief is sometimes obtained by allowing the needles to remain imbedded in the tissues for half an hour or even longer.

Paralysis of the seventh nerve, dependent on alterations in its periphery from draughts or cold, in some cases is quickly removed by painting the skin over the paralysed muscles with blistering fluid. The earlier the application, the greater is the probability of good results.

When gleet obstinately resists all the usual methods for its removal, it is sometimes benefited by a blister applied to the perinæum and along the course of the urethra. A blister applied over the sacrum is sometimes useful in obstinate cases of leucorrhœa, a treatment, however, which cannot be recommended.

In rheumatism blisters are of the greatest service. Flying blisters, applied in proximity to an inflamed and painful joint, often quickly remove the pain, and with the ease thus brought about sleep often ensues, and with it general improvement in the condition of the patient. But blisters have been of old recommended as the sole or chief treatment of acute rheumatism, and some apply them to the extent of free vesication, with the unfounded hope of removing from the blood the poison on which rheumatism is supposed to depend. This method has the disadvantage of reducing the strength of the patient in proportion to the quantity of serum lost, the depletion tending to prolong the attack, and to retard by this means the convalescence, usually sufficiently tedious after a severe attack of rheumatic fever, which induces more anæmia than most other diseases. The advocates of free vesication assert that this method moderates and shortens the attack, and lessens the danger to the heart. In forming this conclusion from the reported cases, the author thinks that due regard has not been paid to the great influence age exerts on the duration of an attack of rheumatic fever; moreover, the cases reported do not appear to have recovered more speedily than is frequently observed in persons of the same age, and manifesting the same body temperature, to whom no medicine at all is given.

The nightly application of a flying blister greatly relieves the pain and swelling of chronic and subacute gout, of gonorrhœal rheumatism, and of chronic synovitis. If this mild application fail, strong vesication should be tried.

Pleurodynia usually yields to anodyne liniments or mild counter-irritants, but sometimes strong vesication is necessary, although the weakening loss of serum may increase the pain for a day or two.

The active principle of cantharides being soluble in oils, it is useful to smear over preparations of cantharides a little simple oil, which moreover helps to maintain the application in contact with the skin.

It must be borne in mind that blistering paste and blistering paper act slowly, requiring several hours to produce a blister, and that blistering paper rarely produces much vesication. If a quick and sharp action is necessary, we must employ blistering fluid, which vesicates in twenty minutes to half an hour.

Applied to the skin, the active principle of the Spanish-fly may become absorbed in sufficient quantity to produce congestion of the kidneys, strangury, and its other characteristic toxic effects; hence, in the treatment of acute or chronic Bright's disease, cantharides should be avoided, as we are unable to regulate the quantity which will be absorbed, and a damaging amount may be taken up by the skin.

We hope it has been made sufficiently plain that in the great majority of cases preparations of cantharides should not be applied long enough to cause much vesication. The vesicles should not be opened, but be covered with a layer of soft cotton-wool, and allowed to remain till the effused serum is absorbed, when a superficial desquamation follows, and no troublesome consequences need be apprehended. If blistering is carried far enough to produce large blebs, the serum will not be absorbed, and the bleb will at last burst. Still it is not advisable to open the blister, but to allow the underlying dermis first to heal partially, when no ulceration need be feared. If the bleb is punctured, it may happen that the air will irritate the raw surface, producing much inflammation, which may end in an extensive slough, an untoward event, especially apt to follow the blistering of young children or old people, or persons whose health is broken down, as the victims of Bright's disease, etc. Hence it is generally considered advisable in such cases to use other counter-irritants. (*Vide* Mustard).

Preparations of cantharides, taken internally, produce an unpleasant burning taste, and, if taken in a large quantity, inflammation and vesication of the mouth.

The effect of cantharides, in the stomach is in all respects similar to that in the mouth. Even small doses cause smarting in the œsophagus, pharynx, and stomach; but larger quantities produce inflammation of these parts and of the intestines, with vomiting, and diarrhœa consisting of bloody and slimy stools, much pain and difficulty in swallowing, and often general peritonitis, with which the system sympathises, as indicated by high temperature and quick pulse.

The active principle of cantharides passes from the stomach and intestines into the blood. Its passage has not been chemically demonstrated, but the symptoms following the administration of the drug render this certain; for after a large dose, all the indications of acute inflammation of the kidneys set in, with much irritation or even inflammation of the urinary and generative organs, and after a poisonous dose, headache, loss of sensibility, convulsions, and death.

The changes cantharidine produces in the blood are at present unknown.

The tincture or powder used to be given in chorea and epilepsy; but in the treatment of either disease cantharides has now fallen into complete disuse.

But little is known concerning the separation of the cantharidine from the body. It is conjectured that, from its volatility, some may pass off by the lungs; but if so, it apparently produces no changes in the mucous membrane of the air-passages in its transit through the lungs. Owing to the same property, it is probable that some of the cantharidine passes off by the skin, and the preparations of Spanish-fly are recommended by several eminent French dermatologists in psoriasis, eczema, lichen, and prurigo. The chief portion of the active principles of cantharides escapes by the kidneys, and, as we have said, acts as a strong irritant to the urinary and sexual organs.

The preparations of cantharides have been recommended by high authority in certain forms of Bright's disease, but for many years it has been considered in this respect a most dangerous remedy.

The discrepancy respecting the effects of cantharides arises, perhaps, from the difference in the dose administered by different observers. The author is convinced of its usefulness in acute Bright's disease, when the active inflammation and fever have subsided, as they invariably do about the fifth to the eighth day. After the subsidence of the more acute stage, it not uncommonly happens that a chronic state follows, and that the urine continues small in quantity, contains albumen, and perhaps blood. If, just at this time, that is, on the immediate subsidence of the acute inflammation, a one-minim dose of tincture of cantharides is given every three hours, the blood will almost always quickly disappear, while the albumen decreases more gradually, and the urine becomes more abundant. At such a crisis it is true that not unfrequently a like amendment takes place without any treatment; but the influence of the cantharides can often be put to a conclusive test. To a patient in the condition described above, passing urine containing albumen and much blood, give minim doses in the way pointed out, and he will begin to improve; but if now the medicine is withheld, both blood and albumen return in their original quantity, and both may be augmented and lessened again and again by withholding and returning to the cantharides, its influence over the blood being speedier and greater than over the albumen of the urine.

Cantharides, in a similar dose, has been recommended even in the acute stage of Bright's disease; and when the kidney, having undergone fatty degeneration, secretes very little urine.

After its separation by the kidneys, cantharides acts as an irritant to the urinary tract, and may be employed in cystitis, gonorrhœa, and gleet. A drop of the tincture, although five are sometimes required, given three or four times a day, is particularly useful in cases where there is frequent desire to make water, accompanied by great pain in the region of the prostate gland, and along the urethra, while at other times severe twinges of pain are felt in the same part. The urine may contain a small amount of pus.

Tincture of cantharides is useful in the incontinence of urine of the aged, and sometimes in that of children. With children, however, it is inferior to belladonna. Unfortunately, each remedy fails in a not inconsiderable number of cases.

A drop of the tincture, three times a day, will in the majority of cases remove chordee.

Cantharides affects the generative organs. Large quantities of the drug congest and inflame these parts, and often produce erection of the penis, effects generally attributed to the sympathy existing between the genitary and urinary tracts. It certainly sometimes excites the sexual appetite, and has been often given criminally for this purpose.

Cantharides has been employed, sometimes successfully, to produce abortion; but the dangers are so great as to deter any medical man from so employing it.

MUSTARD.

Mustard is in common household use as a poultice, as a counter-irritant, or an excitant. Much that has been said of blisters applies to mustard poultices. (See Cantharides.) As has been elsewhere stated, cantharides need seldom be applied to produce much vesication, and with regard to mustard, vesication should be carefully avoided, as the sore so produced is intractable, healing slowly, and paining greatly. Although mustard may be used in all cases where we should employ cantharides short of vesication, still there are differences in their action. A mustard poultice is more painful than a blister, producing a severe burning pain, soon becoming unendurable; and if not speedily removed, it will produce troublesome vesication: therefore a mustard poultice cannot generally be borne for more than twenty minutes or half an hour; and if the skin is delicate, as in children and many women, it cannot be endured for so long a time as this. Owing to the pain it gives, and to its prompter action, a mustard poultice is more effective than a blister when applied to rouse a patient from drowsiness and coma, as in poisoning by opium or alcohol, or in certain conditions occurring in course of fevers. (See Cantharides.)

When a mustard poultice is employed to affect deep-seated diseased organs, as in pleurisy or pneumonia, its action should be sustained for a long time, over a considerable extent, as the larger the tract of skin attacked, the greater is its influence on the organs beneath. Small mustard poultices are less useful, except when employed to remove a localized pain. The poultice should be of large size, diluted with bread or oatmeal, sufficient to cover the front or back of the chest, or both, and should be continued for five, six, or more hours. There is a prevalent idea, perhaps a true one, that cantharides is more searching in its action, and affects more thoroughly the deep parts of the body.

The whole chest of a child should be enveloped in a jacket poultice, which may be retained in its proper place by the following contrivance:—The poultice is spread on a piece of linen, sufficiently large for the purpose, to which tapes are to be tacked, that they may be tied over each shoulder, and at three places in front of the chest. The poultice must be made with tepid water, for boiling water evaporates the active principle, vinegar destroys it, and alcohol prevents its formation. On removing the poultice, the skin should be sponged with warm water, or, if the smarting is severe, with ether, when the application of a layer of cotton-wool, although for the first few minutes it aggravates the pain, soon subdues it altogether.

A general mustard bath, when appropriately used, often does great good. Although it is almost exclusively used for children, yet it is just as serviceable for adults. It may be employed on the recession of the rash of any of the eruptive fevers, to bring it back to the skin. Again, in severe general bronchitis of children, this form of bath proves of great service as a general counter-irritant. A table-spoonful of mustard should be added to a bath sufficiently large for the child, who should be held in it by the nurse till her arms tingle and smart.

A mustard sitz-bath may be used to redden and irritate the skin of the buttocks and thighs when the catamenia are arrested. It should be employed a few days before and during the time the missing discharge should be present, and intermitted at other times. A course of these baths assists considerably the restoration of the uterine functions.

Added to a hot foot-bath, mustard is used to relieve headache, congestion of the head, and inflammation of the internal organs.

It excites in the stomach a sensation of warmth and slight pain, which may be mistaken for hunger, giving rise to the notion that mustard sharpens the appetite and promotes digestion; but it has been proved that mustard does not increase the secretion of gastric juice.

It is somewhat strange that a substance which acts so powerfully on the skin should affect so slightly the mucous membrane of the stomach; for considerable quantities may be swallowed without other effects than the production of nausea and sickness. The mild action of mustard on the mucous membrane cannot be explained by its expulsion by the vomiting it produces; for even when retained, it excites only a little catarrh of the stomach. Mustard is not uncommonly used as an emetic when no other more appropriate is at hand, and when no time can be spared. It appears to have very little action on the intestines, beyond making the motions moister.

Some of the active principle passes into the blood, but it is unknown what influence this has on the organs to which it is conveyed. It is reputed to be a diuretic, but its action in this respect is doubtful; moreover its advocates fail to discriminate the cases in which it is supposed to be beneficial.

It is said to be useful in whooping-cough.

CAPSICUM.

Capsicum irritates and inflames the skin, producing redness, a sensation of warmth or burning, and even vesication, but its preparations are rarely employed as rubefacients. The tincture is sometimes lightly painted over unbroken chilblains, but this application is inferior to the ointment or the tincture of iodine. Preparations of capsicum have a burning, tingling taste, and act on the mucous membrane as on the skin. The tincture as a gargle, in the proportion of a drachm to half a pint of water, is useful in some sore throats, and may be applied under the same conditions which indicate the use of nitrate of silver. Thus, in the very early stage of tonsillitis or pharyngitis, each of these substances, which both act as irritants, will check the inflammation; but when, the inflammation continuing, the deep parts become involved, and the tissues much swollen, irritants of any kind do great harm. In malignant sore throats capsicum gargle may be used with advantage to stimulate the tissues into a healthier condition, and here again its action is similar to that of nitrate of silver. In relaxed throats, when the mucous membrane is bathed with a grey mucus or with pus, the same gargle may be employed, although it is probably not superior to the glycerine of tannic acid.

It acts as an irritant in the stomach, and if taken in large quantities will produce gastro-enteritis. It is often used as a condiment to spur digestion, but whether it is effective in this respect is undetermined. The stomach becomes accustomed to capsicum, and at last large quantities must be eaten to produce any effect.

The author can endorse Dr. Lyon's strong recommendation of capsicum in dipsomania. Ten-minim doses of the tincture, or twenty grains of the powder in the form of pill, obviate the morning vomiting, remove the sinking at the pit of the stomach, the intense craving for stimulants, and promote appetite and digestion. It should be taken shortly before meals, or whenever depression and craving for alcohol arises. Capsicum also induces sleep, especially in the early stages of delirium tremens.

Capsicum is very useful in summer diarrhœas, and in diarrhœas persisting after the expulsion of the exciting irritant. It may be used in flatulence.

IPECACUANHA AND ITS PREPARATIONS.

When applied to the skin, Ipecacuanha after some time produces a sensation of warmth, attended with redness, and the formation of papules; sometimes it produces even pustules, which on healing are not followed by pitting or scarring of the skin.

It has a bitter, disagreeable taste, and so excites a flow of saliva.

In some persons the minutest quantity produces peculiar effects on the membrane covering the eyes, and lining the nose and respiratory tract. On smelling the drug, or even entering a room where it is kept, they are affected with swelling of the loose tissues around the eyes, with injection of the conjunctiva, repeated sneezing, abundant discharge from the nose, severe tensive frontal pain of the head, much oppression at the chest, with frequent cough, and the signs and symptoms of bronchitis. Ipecacuanha thus excites symptoms and appearances similar to those met with in hay fever; that is, it excites a catarrhal inflammation in the mucous membranes specified above. It is highly probable that ipecacuanha produces similar results in all persons, although generally to a scarcely appreciable extent, and that its action differs only in degree. Indeed, it is probable, as we shall see, that ipecacuanha affects all the mucous membranes of the body.

Small doses produce in the stomach a slight feeling of uneasiness, with increase of mucus. Larger doses excite nausea, and a still greater secretion of mucus from the stomach and from the bronchial tubes. Increase of mucus occurs with all nauseating medicines, but probably ipecacuanha excites the secretion of mucus independently of its action as a nauseant and emetic. In animals large doses are stated to produce inflammation of the mucous membranes of the stomach, intestines, and bronchial tubes.

This remedy is frequently used in catarrh of either the stomach, or lungs. It is especially useful when the secretion from the lungs is abundant and tenacious.

In still larger doses it produces both nausea and vomiting, and, like all other emetics, some general weakness, with sweating; and if there is any spasm, relaxation of it. Thus the drug, in nauseating doses, is both diaphoretic and antispasmodic.

It is a mild, tardy, but certain emetic. It produces repeated vomiting, unaccompanied by much nausea or prostration; in these respects, and also in its slighter action on the bowels, it differs from tartar emetic. Its tardy action renders it an unfit emetic in cases of poisoning, and the sulphates of zinc or copper are to be preferred.

On account of its slight irritant action on the mucous membrane of the stomach, and perhaps by the strong movements it produces in that organ when it excites vomiting, ipecacuanha is found of use in irritative dyspepsia, both of the acute and chronic kind. It is a favourite plan with some practical authorities to give occasionally in such cases ipecacuanha in emetic doses. It is sometimes given to produce vomiting in children with bronchitis, when the obstruction to their breathing is great from mucus in the bronchial tubes. The movements of vomiting expel much mucus mechanically, and temporarily improve the breathing. On account of the mildness of its operation, ipecacuanha is to be preferred in such cases, and as an emetic for delicate persons.

The quantity required to excite vomiting varies greatly in different people. With some the smallest quantity is sufficient, while with others large doses are inoperative. As a rule, children require large doses, and babies only a few months old may need ten or twenty grains of the powder.

Whether ipecacuanha produces vomiting by its action on the stomach, on the nervous centres, or on both, are unsettled questions. When emetina is injected into a vein, or under the skin, it excites vomiting; so does tartar emetic; but this drug can certainly excite vomiting by its influence on some part other than the stomach, as shown by Magendie, who, after removing the stomach of a pig, and substituting a bladder, yet excited vomiting by the injection of tartar emetic into the veins. In this instance it is observable that the tartar emetic did not excite vomiting by its effects on the stomach, but by its influence on some other part of the body, probably the nervous centres which govern vomiting. Ipecacuanha may possibly act in the same way.

Few remedies are so efficacious in checking some kinds of vomiting as ipecacuanha. The author in numerous instances has witnessed the wine administered in drop doses, every hour or three times a day, according to the urgency of the case, check the following kinds of sickness:—

1. Of Pregnancy.—This vomiting is not always of the same kind. With some persons it occurs only in the morning, and is excited by the first movements made on waking. This form in most instances will yield to ipecacuanha, taken in the way described. Should it fail, however, relief may be obtained in many cases by the administration of the medicine to the patient on waking, and some time before any movement is allowed. In other instances the vomiting occurs not only in the morning, but is frequently repeated during the day, recurring whenever food is taken, and may be so severe that no meal is retained, while during the intervals of meals there may be constant nausea and great loathing of all kinds of food. Vomiting and nausea of this kind ipecacuanha will in most instances immediately arrest, while the appetite returns, and the stomach bears almost any kind of food. In these cases it may happen that ipecacuanha checks the nausea and vomiting, with the exception of that recurring immediately on moving in the morning, when on the administration of a dose on first waking this will also cease.

In other instances there may be no vomiting in the early morning, but this may occur only on taking food, increasing in severity as the day advances, and becoming most severe in the evening. Should ipecacuanha, as is sometimes the case, fail to check this kind of sickness, then nux vomica may be substituted for it, which generally affords the desired relief.

In some pregnancies, besides the sickness and nausea, there is much heart-burn, and perhaps great flatulence, symptoms which in many cases yield quickly to ipecacuanha; but here again, should this remedy fail, nux vomica will generally afford relief, which may be rendered more complete if both remedies are employed. It is singular that while ipecacuanha will remove, in pregnant patients, even excessive flatulence, when this co-exists with sickness; yet if the flatulence occurs without sickness, this medicine is generally unavailing, and recourse must be had to nux vomica, charcoal, sulphurous acid, or sulpho-carbolate of soda. Of all these drugs most reliance is to be placed on the sulpho-carbolate, in doses of five to fifteen grains dissolved in water, and administered immediately after a meal.

It has been stated in the preceding remarks that, in some instances, nux vomica succeeds when ipecacuanha fails. This is notably the case when the tongue is coated with a creamy fur, when the stomach is out of order, and when there is much acidity and heart-burn. In these cases it is often a useful practice to give both nux vomica and ipecacuanha at the same time.

It must be confessed, however, that in some instances, at present unexplained, ipecacuanha fails to afford the expected relief. In these, it may be, the vomiting is kept up by a displacement of the uterus, or by a chronic inflammation of this organ, or of its cervix, or os, as was long since pointed out by Dr. Henry Bennett, when the treatment should be directed to the removal of these affections.

2. Some women, who have been untroubled with nausea and vomiting during pregnancy, suffer with both these symptoms during the whole or part of the time of suckling. These symptoms usually begin after the first few weeks of suckling, and continue till the child is weaned, and may be so severe, and produce so much exhaustion, as to compel the mother prematurely to wean her child. The nausea and vomiting may be accompanied by great flatulence. All these symptoms, in most instances, will cease on the employment of drop doses of ipecacuanha wine, administered three times a day.

3. Similar troubles to those just pointed out afflict some women each time they menstruate, occurring immediately before, during, or directly after the period. These cases will generally yield to ipecacuanha.

4. The morning vomiting of drunkards; but this morbid state can be still better controlled by arsenic.

5. The morning vomiting which sometimes accompanies general weakness, and is met with in convalescents from acute diseases.

6. It often immediately controls the vomiting in children, with acute catarrh of the stomach. Indeed, the remedy appears to

have a greater influence over the vomiting of children than of that of adults.

Arsenic succeeds admirably also in removing the vomiting of acute catarrh of the stomach; and either remedy may advantageously be given with aconite, to subdue the inflammation, and reduce the fever.

7. It often removes or lessens the vomiting of whooping-cough, when this is produced by the violence of the cough, although it may in no way lessen its severity. Cases occur of vomiting from this cause, which are unaffected by ipecacuanha, but immediately yield to alum. (See Alum.)

8. There occurs a species of vomiting after meals, without nausea or pain, or even discomfort, the food being merely rejected, partially, and often very little, digested. This complaint may endure a considerable time, but in many instances is quickly stayed by ipecacuanha wine. Arsenic, however, is a still better remedy.

Ipecacuanha, in the author's experience, proves of little use in the following forms of vomiting:—

1. Where, in children, the vomiting matters are composed of hard and large lumps of curdled milk. In such a case, lime-water mixed with the milk is the best remedy, if diarrhœa is present; but if the child is constipated, bi-carbonate of soda must be substituted for the lime-water; and should both these remedies fail, recourse must be had to a diet altogether free of milk.

2. It is not generally useful in that form of vomiting met with in young children, a few weeks or months old, who, as soon as it is injested reject the milk almost immediately, with considerable force, perhaps through both nose and mouth, the milk being either curdled or not. At the *post-mortem* examination nothing may be discovered to explain this fatal form of vomiting; but sometimes the mucous membrane of the stomach is extremely soft, and looks as if made of water arrowroot. This form of vomiting is best treated by small hourly doses (one-third of a grain) of grey powder, or by calomel (one-tenth of a grain.)

3. In hysterical vomiting.

Ipecacuanha is sometimes effective in checking the vomiting from cancer of the stomach, and has succeeded sometimes where the more commonly used remedies have entirely failed.

Ipecacuanha excites in the mucous coat of the intestines an increased production of mucus, and in this way is slightly purgative, and is reputed to assist the action of other purgative medicines, as jalap. It is also stated that constipation, depending on great torpor of the intestines, may be relieved by taking a grain of powdered ipecacuanha each morning while fasting. The same treatment will, it is said, remove the dyspepsia frequently accompanying the above state, which is associated with much depression of spirits, some flatulence, coldness of the extremities, and the food lies on the stomach "like a heavy weight."

This drug, as is well known, is much used in dysentery, and in many instances with very great benefit. In some epidemics it answers admirably, while in others it appears to be without effect. Large doses are required, and will often succeed where small ones fail. Sixty to ninety grains of the powder are given at a dose, and repeated if required, oftentimes without the production of either nausea or sickness; but should these arise, they may generally be obviated if the patient, after the administration of the medicine, remains quiet and lies on his back. In chronic cases, and where immediate treatment is not required, it is a good practice to administer the first dose at night, after the patient has retired to bed. Should the few first doses excite sickness, it soon ceases on the continuance of the medicine.

E. S. Docker, who has had a very large experience of this treatment, extols ipecacuanha. He states that its effects on suitable cases are almost instantaneous; the motions in the very worst cases becoming natural in frequency and character. He has seen ninety grains of the powder at once cut short very severe attacks of dysentery, and not only restraining the discharge at once, but freeing the patients immediately from pain, while the bowels acted without straining or griping, and the evacuations became natural. The disposition to relapse, so common in acute dysentery, is not observed when ipecacuanha is employed; and there is no call for after treatment, nor any great care needed, as is the case after other kinds of treatment, concerning the quality of food.

After the administration of a large dose, as sixty or ninety grains, Docker recommends waiting ten or twelve hours before repeating it; and should the bowels meanwhile not have acted, the medicine need not be continued.

The dysenteric diarrhœa of children, whether acute or chronic, will very generally yield speedily to hourly drop doses of ipecacuanha wine. The especial indications for this treatment are slimy stools, green or not, with or without blood. Vomiting, if present, as is commonly the case, affords an additional reason for the adoption of this treatment, or it will speedily cease, often after the first or second dose of the medicine, and generally before the diarrhœa is checked. It sometimes happens that although the dysenteric character of the evacuations is removed by the ipecacuanha, and their number, though still too frequent, is much reduced, that other treatment may be required to effect a cure.

The active principle of ipecacuanha, without doubt, enters the blood, and we have next to consider its action on the distant organs of the body.

It produces an increased secretion from the bronchial mucous membrane. Some have maintained that this occurs only when ipecacuanha excites nausea, and that the drug can act in this way solely by producing this physiological state. During nausea, as is well known, an increased secretion from most of the surfaces of the body occurs, and amongst others, from the mucous tract we are now speaking of. Others consider that it can affect this mucous membrane irrespective of the production of any sensation of sickness; and that this is the correct view, is borne out by the powerful effect of even a minute quantity of this medicine on the bronchial tract of some persons, in whom the same dose does not produce sickness or even nausea.

In the form of wine, this remedy is of almost constant use in bronchitis, when the expectoration is profuse, and difficult to expel.

Dr. Hyde Salter strongly recommends ipecacuanha in hay asthma, and in other forms of asthma. He uses it to cut short a paroxysm of dyspnœa, and considers that, in common with tobacco and antimony, it controls by virtue of its action as a depressant. He prefers it to the other two remedies just named, and gives it in doses large enough to cause depression, but too small to excite vomiting. To be effectual, like other depressants it must be given at the very beginning of the attack of dyspnœa; for if this is fully developed, the power of the remedy is considerably lessened. He prefers the powder to the wine, and seldom gives less than twenty grains. This treatment, directed only against each attack of dyspnœa, leaves the complaint in other respects untouched, and more permanent relief must be sought in an appropriate diet, and a climate suited to the patient.[*]

[*] Dr. Hyde Salter, in a recent lecture, has drawn prominent attention to the influence of diet on pure asthma. As persons prone to asthma suffer from tightness of the breath for some hours after a meal, and the smallest quantity of food greatly aggravates an attack of asthma, therefore the meals must be small, and composed of most digestible food. Asthmatic attacks occurring most commonly at night, seeming to be favoured by sleep, an attack being often warded off by the patient keeping awake, and as the attacks are especially liable to occur after a late meal, therefore an asthmatic should take a light tea, and go without supper; in fact, should take no full meal after two o'clock. Breakfast should be the chief meal. Asthmatics must rise early, to avoid a too prolonged fast. Their food must be plain, well cooked, and nutritious. Milk and eggs form a good diet. Cocoa is better than tea, but milk is better than either. Mutton is superior to beef or lamb, while pork and veal must be prohibited; new boiled potatoes or succulent vegetables may be permitted. Fish is suitable. Cheese, dessert, preserved meats or fruits, must not be eaten, and stimulants of any kind are generally bad. Heavy malt liquors, especially those containing much carbonic acid, are the worst of drinks. The quantity of food should not be large, although food does not induce the paroxysm by its bulk, as the attack generally occurs some hours after a meal, when the stomach is becoming empty. Most asthmatics may eat what they like at breakfast. Dr. Pridham, who has had great success in his treatment of asthma, and who long ago pointed out the importance of a regulated diet, orders for his patients the following diet:—Breakfast, at eight, half a pint of green tea or coffee, with a little cream, and two ounces of dry stale bread. Dinner, at one, two ounces of fresh beef or mutton, without fat or skin, two ounces of stale dry bread or well-boiled rice. Three hours after dinner, half a pint of weak brandy and water, or toast and water *ad libitum*. Supper, at seven, two ounces of meat and two ounces of dry bread. He prohibits drinking for an hour before dinner or supper, and till three hours after meals. When digestion has improved, he allows his patients three ounces of meat twice a day. The following excellent remarks on the climates suitable for asthmatics are Dr. Salter's.

(*a*.) Residence in one locality will radically and permanently cure asthma, resisting all treatment in another locality.

(*b*.) That localities which are the most beneficial to the largest number of cases are large, populous, and smoky cities.

(*c*.) That this effect of locality depends probably on the air.

(*d*.) That the air which would be imagined to be the worst for the general health

Ipecacuanha is useful in many cases of whooping-cough It may lessen the severity and frequency of the paroxysms, and, as has been already mentioned, it will often arrest the vomiting they produce. Dr. Phillips and some other observers consider it to be especially useful when the attacks of coughing are accompanied by retching and vomiting. Like other remedies employed in whooping-cough, it fails often in cases apparently in all respects similar to those it benefits, and in certain epidemics it appears to be all but useless.

It is also supposed to be a diaphoretic, and of course excites sweating when it excites nausea; but perhaps even without this condition it may be a diaphoretic.

It has been highly praised for its usefulness in hæmorrhages, as in epistaxis, bleeding from the lungs or womb, and the flooding after delivery. Some of its advocates give even drachm doses of the powder.

In flooding after delivery, Higginbotham recommends ipecacuanha, in a quantity sufficient to produce vomiting, and ascribes to this effect its great efficacy in arresting the hæmorrhage. In his hands, this treatment has been successful in the most desperate cases of flooding. It may well be doubted, however, whether beyond its emetic effect ipecacuanha exerts any influence over uterine hæmorrhage. Zinc would probably answer equally well. Dr. George Bird tells me that he once witnessed, in the case of a Syrian Jewess, the prompt suppression of flooding by her attendant, who crammed down the patient's throat a handful of her hair. Probably the mechanical excitation of vomiting would prove useful in flooding.

Trousseau recommended ipecacuanha as a useful remedy immediately after childbirth. It is to be continued for some days,

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is, as a rule, the best for asthma. Thus the worst parts of cities are the best, and conversely.

(*e.*) This is not always the case, the very reverse being sometimes so.

(*f.*) That there is no end to the apparent caprice of asthma in this respect.

(*l.*) That possibly there is no case of asthma that might not be cured if the right air could be found.

(*m.*) That the disposition is not eradicated, but merely suspended.

and is stated to promote the natural functions peculiar to that time.

Ipecacuanha acts most surely as an emetic when given in divided doses at short intervals; as five grains in a little warm water every five or ten minutes.

VERATRUM VIRIDE.
VERATRUM ALBUM.
VERATRIA.

THE preparations of these substances applied to the skin excite some inflammation, accompanied by burning and stinging. In the form of ointment, veratria (20 to 40 grains to the ounce of lard) has been employed as a local application to remove the pain of neuralgias and of rheumatism, but being inferior to aconitia, is now but seldom used.

When snuffed into the nose, the powder of veratrum excites violent sneezing.

In large doses the veratrum preparations produce nausea and vomiting, sometimes severe and prolonged. V. viride is said to act often as a purgative, but this is far from being frequently the case, even after doses large enough to cause great prostration and vomiting. Veratrum album is said to be more purgative than V. viride. These effects occur when the medicine is injected under the skin (Oulmont). In animals poisoned by veratrum there was no trace of inflammation of the intestines.

The active principles of these substances pass readily into the blood, as is sufficiently proved by the symptoms they occasion. These are dull, heavy, frontal headache, sometimes accompanied by shooting or stabbing pain over one or both brows. Similar pains are felt at the pit of the stomach, and at the region of the heart. The heart is greatly affected; for the pulse grows slow and weak, and may be reduced from 70 or 80 to 40 or 35 beats in the minute, and at the same time become so weak as to be scarcely felt at the wrist. Under the full action of the medicine the muscular strength is much prostrated, perhaps to the extent of rendering walking impossible. The muscles may twitch and jerk spasmodically. With this great prostration the surface is bedewed with a clammy sweat, the features are pinched, and there may be complete blindness and deafness, but delirium is rare. Dangerous as these symptoms appear, yet if the drug is discontinued they speedily cease. Dull, aching pains, made worse by movement, have occurred in some self-experimenters, and tonic and atonic contractions of the muscles, sometimes violent, especially of the face and extremities. This substance has the same prostrating effect on birds, and in America is sometimes used to destroy these animals. It makes them too weak to fly, and thus they are easily caught; but if left awhile, the effects of the drug pass off, and they escape.

Veratrum has been compared, on the one hand, to digitalis; on the other, to aconite. Like digitalis, it is said to strengthen the contractions of the heart, and to weaken them only when the dose is excessive. The properties of veratrum appear to be more allied to those of aconite.

Kölliker's experiments lead him to conclude that veratria excites the medulla oblongata and spinal cord, producing slight transient tetanic convulsions; that it directly affects the striped muscles, paralyzing them, but that probably it does not affect the brain, the sensory, or motor nerves. He further believes that it paralyzes the heart by its direct action on that organ, and not through the pneumo-gastric nerve; for after destroying the functions of this nerve by curare, veratria still paralyzed the heart.

Dr. Paul Guttman has investigated minutely the physiological action of veratria injected under the skin or swallowed. A very small quantity soon excites in frogs heightened reflex irritability, powerful muscular contraction being excited by the movements of the animal, or by irritation. The frog soon becomes tetanized, while voluntary movement and muscular contractility, on galvanic stimulation, become quickly abolished, the brain apparently remaining unaffected. Veratria produces paralysis, likewise, in warm-blooded animals, but tetanus very rarely, these animals dying either from respiratory or cardiac paralysis. The general paralysis of the voluntary muscles is not owing to muscular exhaustion produced by powerful tetanic contractions; for paralysis is produced in warm-blooded animals without tetanus; and in frogs muscular contractility is lost in limbs protected from tetanus by division of their nerves; for on severing the femoral nerve the muscles lose their irritability equally as soon as those of a limb with an unsevered nerve, although, owing to the division of the femoral nerve, no tetanic convulsions in the limb took place. Further, by tying the abdominal aorta to protect the posterior extremities from the influence of the poisoned blood, they became tetanized, but retained for a considerable time their irritability. The paralysis is not owing to any alteration in the trunks of the motor nerves; for so long as the muscles contract under direct galvanic stimulation, so long do the nerves conduct impressions to the muscles. The loss of motion depends, therefore, either on changes produced in the muscles, or in the terminations of the motor nerves. As the motor nerve trunks are unaffected, and nerve poisons spread either centripetally, like curare or conia, or centrifugally, like the cyanides, there being no known instance of a poison affecting solely one end of a nerve, veratria probably affects the muscles, and not the terminations of the motor nerves. The rapid occurrence of rigor mortis and acid reaction of the muscles makes it probable that veratria kills the muscles; for these phenomena do not set in early after nerve-poisoning. Veratria induces rigor as soon as muscular irritability is destroyed. Veratria produces no morphological change in the muscles till rigor mortis sets in.

As veratria affects the frog's heart much less than the other muscles, and as, unlike the effect of most other cardiac poisons, the cessation of the heart's contractions takes place in physiological order, Guttmann concludes that it is a heart-poison less markedly than many other poisons.

Veratrum has been said to lower the temperature in health; but Dr. Squarey's observations on University College Hospital patients prove that this is not the case.

Veratrum viride has been employed in the convulsions of children, chorea, typhoid fever, scarlet fever, measles, pneumonia, and pleurisy. In regard to pneumonia and pleurisy, some authorities consider that veratrum is useful only in the sthenic forms, acting then like tartar emetic or aconite. Others, however, as confidently recommend this remedy in the asthenic forms. The numerous published cases tend to support the efficacy of this remedy in pneumonia. Out of forty cases published by Dr. Kieman, five died, making a per-centage of 12·5; but of these some were in a desperate condition before undergoing treatment, so that the per-centage is probably higher than it would have been had the medicine been employed at the beginning of the attack. Dr. Drasche has recorded seventy-three cases, and speaks very highly of this remedy. It greatly lessened the pulse, and lowered the temperature from 1° to 3° C. It quieted the breathing, changed the character of the expectoration to a light yellow colour, and rendered it scantier. It did not appear to shorten the acute stage, but seemed even to lengthen it. This treatment quieted and composed the patients. This observer states that veratrum retards the resolution of the lung, and sometimes produces vomiting of watery grass-green fluid, and occasionally diarrhœa. He also states that on discontinuing the remedy before the decline of the disease, the pulse again immediately rises. The experience of others, though favourable to the veratrum treatment, has not been so successful; indeed, it is obvious how very difficult it is to ascertain whether the effects attributed to it were really due to the veratrum. The experience of others shows that this drug reduces the pulse, but often only temporarily, and that if its effects are to be maintained, it must be given in increasing doses. Further, while it is admitted that the temperature is reduced, it is not lowered to the extent stated by Drasche, nor is the inflammation checked or shortened.

It is asserted that typhoid fever may be beneficially treated by veratrum.

Oulmont has pointed out that the alkaloid veratria does not produce the effects on the body just described, which must therefore be owing to some other constituent of the plant; hence the tincture, not the alkaloid, must be used.

In the treatment of the foregoing diseases it is better to give small doses, as one or two minims every hour, rather than larger ones at longer intervals. As already pointed out, the medicine must be gradually increased, in order to keep the pulse reduced; otherwise it will in some cases suddenly rise to 120 or 140 beats, which may be again reduced in a few hours by a small increase of the dose.

Veratrum is said to be efficacious in removing the pain of acute rheumatism, and in controlling and shortening the fever. It is also said to be of service in neuralgia, sciatica, and lumbago, and in the "congestive headache" which occurs at the menstrual period.

Veratrum album has been used with success in the vomiting and purging of summer diarrhœa.

COLCHICUM.

While the physiological effects of colchicum are very similar to those of veratrum, yet in the treatment of disease one cannot be substituted for the other.

Strong preparations of colchicum, applied to the skin, are irritating, excite redness, pricking and smarting, and the powder of the corm sniffed up the nose excites sneezing and watery discharge from the eyes and nose.

Colchicum is acrid to the taste, produces much irritation of the fauces, and increase of saliva, sometimes in such quantity as might well be termed salivation.

Colchicum is an irritant to the stomach and intestines, and produces its effects whether the medicine is swallowed or injected into the veins.

Small doses, continued for some time, produce a coated tongue and disagreeable taste, impair the appetite, excite more or less thirst, with pain at the epigastrium, rumblings of the stomach, and looseness of the bowels.

Should vomiting occur, the ejected matters are bilious, or composed of mucus, and after a large dose may contain blood. The stools are soft, or even liquid, and of a high colour; but after a large or poisonous quantity these are at first of the character just mentioned, but afterwards become dysenteric, consisting of slime and blood, accompanied with much straining and cutting pains in the belly.

Colchicum is rarely used in diseases of the alimentary canal. It has been employed as a cholagogue, and, it is said, with success in cholera.

Some consider this medicine does most good in both gout and rheumatism when it purges. Others hold this to be not only unnecessary, but injurious. There is no doubt that colchicum will as quickly cure an attack of gout without purging.

Colchicum quickly enters the blood, and in full doses soon excites warmth at the stomach, with a glow and outbreak of perspiration of the whole surface of the body, throbbing of the vessels, and reduction of the pulse in frequency and force.

Poisoning by this plant or its preparations produces profound prostration, sometimes pain in the head, pinched features, perspiring, clammy skin, small, weak, or intermittent quick pulse, and not unfrequently strong muscular twitchings, accompanied by pain; indeed, pains have been felt in all the extremities, and Dr. Henderson narrates a case in which most of the joints were painfully affected. Colchicum is said to cause pain in the urinary tract, with smarting on micturition.

After a quantity sufficient to produce the symptoms just detailed, the stomach and intestines are found much congested and inflamed.

It is reputed to be diuretic, and to stimulate, even in healthy persons, the secretion of a large quantity of urinary water and uric acid; but these statements have not been confirmed by the observations either of Böcker or Garrod, which show that if it acts at all on the kidneys, colchicum rather lessens the amount of excreted water, urea, and uric acid.

To Dr. Garrod the profession is indebted for an exact knowledge of the nature of gout. This philosophical observer has shown that in gout there is a retention, with possibly an increased formation, of uric acid in the system. From the urine of gouty patients, very little, or even, in some cases, no uric acid can be obtained, while plenty can be detected in their blood. The urates thus circulating through the tissues are deposited in various parts of the body, and in the act of deposition excite active and painful inflammation.

Colchicum, it is well known, gives prompt relief from the pain, inflammation, and fever of gout. But how? Does colchicum cause the elimination of uric acid from the system through the kidneys, and so remove the condition on which the gout immediately depends? Now Dr. Garrod has experimentally shown that colchicum exerts no influence on the elimination of uric acid in gouty people. Colchicum must therefore possess a power of controlling gouty inflammation without in any way affecting the condition on which the gouty inflammation in the first instance depends. Colchicum, therefore, is merely palliative, removing for a time the patient's sufferings, but, as experience abundantly proves, in no way protecting him from their return. For it is on all hands accepted, that colchicum is inoperative to prevent a return of the attack; nay, many who suffer from it are of opinion that, while the medicine removes altogether an existing attack, it ensures the speedier return of another. Hence, gout-ridden people commonly advise their fellow-sufferers to abstain from colchicum. But a gouty sufferer is apt to continue gout-engendering habits, and to forget that, as he grows older, his gouty tendency grows stronger.

The effect of colchicum on the gouty inflammation is very rapid; for a large dose of the medicine, say a drachm of the wine, often removes the severest pain in the course of one or two hours, and soon after the swelling and heat subside. Some observations conducted by Dr. Rickards and the author, show that while the pain is thus quickly subdued, the temperature of the body falls but very little during that day, but on the following morning there is generally a considerable decline, and often a return to the healthy temperature; but should the fall be deferred for a longer time, then on the second day after the use of the colchicum a continuous decline of the temperature takes place, till all fever disappears.

There are two methods of employing colchicum. Some give small doses, others give a drachm of the wine, others even two drachms at a time. The larger dose sometimes produces sickness, diarrhœa, and great temporary weakness, but it extinguishes the pain at once. Small doses give like results only after some days.

Colchicum is sometimes of use in the treatment of various diseases occurring in gouty persons; for instance, bronchitis, asthma, chronic urticaria and other eruptions, dyspepsia, etc.

Seeing the rapid effect of colchicum on gouty inflammation, it is singular how little influence it has on other kinds of inflammations, as pneumonia, erysipelas, or acute rheumatism. Many doctors employ it in acute rheumatism, some giving it in the synovial, others in the fibrous form of rheumatism.

PODOPHYLLUM.

PODOPHYLLUM is a powerful purgative, and is generally considered a cholagogue.

Dr. Anstie, who has studied the action of podophyllum on dogs and cats, found that in from two to ten hours after the injection into the peritoneal cavity of an alcoholic solution, and after the effects of the alcohol had ceased, podophyllin excited vomiting and almost incessant diarrhœa. Dr. Anstie does not usually describe the character of the stools; but in one experiment he states that they consisted of glairy mucus, and in two other experiments the stools were highly coloured with what looked like bile. In many of the experiments the stools contained blood. The animals suffered great pain, and soon became exhausted. At the *post-mortem* examination the œsophagus was healthy, but the stomach somewhat congested, induced, as Dr. Anstie suggests, by the violent efforts of vomiting. The small intestines, especially at the lower part of the duodenum, were intensely congested, and in some instances the lower part of the duodenum was extensively ulcerated. The large intestines were but slightly inflamed. Although the injections were poured into the abdominal cavity, the peritoneum itself was not at all inflamed, not even around some unabsorbed granules of podophyllin. The contents of the intestines were liquid. In all the instances in which the effect of the medicine on the heart and respiration is mentioned, respiration ceased before the heart stopped. From these experiments it is evident that podophyllin has an especial affinity for the small intestines, and chiefly for the duodenum.

The results of these experiments, and the fact that podophyllin produced no apparent change in the liver, led Dr. Anstie to conclude that it is not a cholagogue. The Edinburgh Committee carefully investigated the action of podophyllin on healthy dogs. Their reporter, Dr. Hughes Bennett, states that doses of podophyllin varying from two to eight grains diminished the solid constituents of the bile, whether they produced purgation or not, and that doses which produced purgation lessened both the fluid and solid constituents of the bile.

But assuming that podophyllin is incapable of increasing the secretion of bile in health, it by no means follows that in this respect it is inoperative in disease. It is quite conceivable that podophyllin and other remedies may remove certain morbid conditions of the liver which arrested the secretion of bile, and so act indirectly but efficaciously as cholagogues; and surely it is far better to promote the secretion of bile by restoring the liver to health, than to give a drug (if such exist) to compel a diseased liver to secrete. In the one case we remove the hindrance to the secretion of the bile; in the other, if it be possible, we compel the secretion in spite of this. The experience of those who have largely used this drug is strongly in favour of its possessing cholagogue properties; and the author's experience leads him to a like conclusion.

For instance, its effects are very marked on the motions of children with the following symptoms:—During the early months of life, and especially after a previous attack of diarrhœa, obstinate constipation may occur, with very hard motions, crumbling when broken, and of a clay colour, often mottled with green. Sometimes the passage of the hard stools through the sphincter of the rectum occasions great pain, causing the child to scream at each evacuation. At the same time there may be much flatulent distention of the belly, which excites frequent colic, and this, in its turn, makes the child cry, often without cessation. This morbid condition of the motions is frequently witnessed in children of one or two months old, who are fed instead of suckled. The author knows nothing so effectual in bringing back the proper consistence and yellow colour to the motions as podophyllin. A grain of the resin should be dissolved in a drachm of alcohol, and of this solution one or two drops are given to the child on a lump of sugar, twice or three times in the day. The quantity administered must be regulated by the obstinacy of the bowels, which should be kept open once or twice a day. Under this treatment, often immediately the motions become natural, the flatulent distension of the belly gives way, and the child quickly improves. The restoration of the colour to the motions is probably owing to the increased secretion of bile by the action of the podophyllin.

That disagreeable cankery taste, unconnected with excess in alcoholic drinks, generally occurring only in the morning, but sometimes continuing in a less degree all day, gives way usually to podophyllin; and if it fail, mercury generally answers. It is true that this symptom, when due to constipation, may be removed by many purgatives, but podophyllin and mercury are far more effective.

Small doses of podophyllin are highly useful in some forms of chronic diarrhœa. Thus a diarrhœa of high-coloured motions, with cutting pains, is generally relieved by small doses of podophyllin, the bowels becoming regular, and the pain speedily subsiding. The author has cured, with podophyllin, chronic diarrhœa of watery, pale, frothy motions, with severe cutting pains, even when the diarrhœa has lasted for many years. Two or three minims of a solution containing a grain of podophyllin in two drachms of rectified spirit should be given three or four times a day.

Podophyllin is very useful in some forms of sick headache. The term sick headache we restrict to an attack depending on some derangement of the stomach, intestines, or liver, excluding those forms of sickness excited by a violent attack of cranial neuralgia. No doubt there are a great variety of sick headaches, some accompanied by constipation, others by diarrhœa, and in each of these kinds the stools may be either too light or too dark in colour. Besides those thus roughly sketched out, there are many other varieties of sick headache. Where the headache is preceded, accompanied, or followed by a dark-coloured bilious diarrhœa, podophyllin generally does good. The solution above described, in two or three minim doses three times a day, restrains the diarrhœa, lightens the colour of the motions, and if the medicine is continued, either prevents these attacks, or considerably prolongs the intervals between them. Where the diarrhœa is of a light colour, and the motions evidently contain too little bile, a hundredth part of a grain of bichloride of mercury, given three times a day, will afford considerable relief. Again, when the headache is accompanied by constipation, and the motions are of a dark bilious character, a free podophyllin purge every day or alternate day is very useful. Even in those neuralgic pains in the head, occurring either just before, at, or directly after the menstrual period, if associated with constipation with dark-coloured stools, purgative doses of podophyllin often give relief.

It has been asserted by some American physicians that this drug fulfils all the indications of mercury.

The injection of podophyllin under the skin has been recommended. It can be readily dissolved in equal parts of liquor potassæ and water; and this solution, if the drug is pure, is not precipitated by the addition of water. In doses of one-third to one-tenth of a grain of podophyllin this solution quickly purges, sooner, it is said, than when given by the stomach, and it causes no pain.

Podophyllin is a rather uncertain purgative. The pure drug causes very little griping. If given in too large doses, it is very apt to produce slimy and bloody stools, particularly in children.

STAPHISAGRIA.

This seed, made into an ointment, is employed only as an external application, to destroy the lice which infest the bodies of many dirty people.

Formerly the seeds were ground to a meal, which was mixed with a simple ointment. But as the meal was always very coarse, on account of the large quantity of oil the seeds contain, the ointment thus made was a gritty and uncomfortable application. This inconvenience has been remedied by a plan suggested by Mr. Squire, who says, "Finding that this meal contained a certain amount of oily matter, the author had the oil removed from a small quantity of the meal by percolation with ether, and found that the meal was then capable of being reduced into a fine powder." This powder he tried in several cases of phthiriasis (louse disease), and found it quite inert. "On inquiring what proportion of oil had been extracted from the meal, he found that it amounted to as much as one half (by weight) of the meal. On making trial of the oil, suitably diluted with olive oil, he found it as efficient as any remedy he has ever tried against phthiriasis. A cheap way of preparing the oil for application is to digest the seeds in melted lard, and strain while hot. The filtrate is an ointment of the seeds of stavesacre. Two drachms of the bruised seeds should be used to an ounce of lard."

ACTÆA RACEMOSA.

This medicine is used much more extensively in America than in England. It has been employed for centuries by the Indians and settlers, for chorea and many uterine diseases, and to assist the uterus to expel the child. Those most experienced in the employment of this drug speak loudly in its praise.

Although not used as a local application to the skin, some assert that given internally it will prevent the pitting of small-pox.

Actæa is said to be useful in simple and malignant sore throat, and in that troublesome chronic and obstinate disease in which the mucous membrane of the pharynx is quite dry, and spotted over with inspissated mucus.

This remedy is not, as far as the author knows, used in stomach or intestinal disease.

Absorbed into the blood, it depresses both the force and frequency of the pulse. Some compare it to aconite, and use it for similar purposes. It has been given, it is said, with much success, in influenzas and catarrhs, accompanied with headache, stiffness of the muscles, dull, aching pain in the bones, and a bruised sensation as if the body had been beaten all over.

This plant has been much used in acute rheumatism. It is said to quell the pain speedily. It is also extolled for lumbago and sciatica; and it is said to subdue lumbago more effectually than any other remedy.

The author has given this plant a patient trial in lumbago and sciatica, and in those cases of chronic rheumatism where one part of a tendon, muscle, or articulation in the back or elsewhere, is exquisitely painful on movement, and in cases characterized by great stiffness of the muscles of the back, loins, and hips, but unfortunately with very little if any success.

In his hands, however, this remedy has yielded very satisfactory results in certain forms of chronic rheumatism; for instance, rheumatoid arthritis, where the joints are enlarged and much stiffened. It does not, however, suit all cases alike, but those best in which the pains are worse at night; and the remedy may be considered especially indicated when the disease can be traced to some previous derangement of the uterus, as sudden suppression of the menses, an abortion, a painful and difficult confinement, or to the disappearance of the catamenia at the natural term. It may be that the joints are not enlarged, and the pains may flit from joint to joint instead of lodging steadily in one place. Painful cramps of the legs sometimes torment such patients. The symptoms are aggravated by wet and cold weather, and by certain winds. The sleep is much broken by the pains. In these cases, actæa not unfrequently gives considerable relief from pain and cramps, and induces quiet and refreshing sleep, independently of its possible narcotic action. But while the indications just given are for the most part to be depended upon, it must be confessed that this remedy does sometimes relieve chronic rheumatism and rheumatoid arthritis occurring in men, and is sometimes serviceable in those cases in which the pains are worst during the day.

Again, in a case like the following, actæa is signally beneficial: A patient is first troubled with pains, apparently rheumatic, in most of the joints, but with scarcely any fever or swelling of the painful parts. The disease soon seats itself in one part, as the wrist and hand; the tissues here become much thickened, the bones of the wrist enlarged, till after a time all movement is lost, and the member becomes useless. Warmth allays the pain, and it almost ceases at night. The attack presents many of the characters of gonorrhœal rheumatism, but there is no history of gonorrhœa. The author has witnessed, several times, the almost instant relief given by this drug in cases like that just described, after iodide of potassium and other remedies have been fairly tried in vain, the pain giving way at once, and the joints becoming again supple and useful.

Chorea, it is said, whether rheumatic or otherwise, yields to actæa. The author has put this statement to the test of experience, and has found that actæa fails altogether when there is no history of rheumatism, but apparently sometimes succeeds when the chorea had a rheumatic origin. It is greatly inferior to arsenic in chorea.

According to American therapeutists, this plant operates powerfully on the generative organs of the female. Its action on the uterus is said to be very similar to that of ergot. It stimulates the contractions of the parturient uterus, and hastens the expulsion of the child. Ergot produces a constant and continuous contraction of the uterus, while actæa merely strengthens, but does not prolong the contractile movements of this organ. Actæa, therefore, endangers much less the life of the child, and the soft structures of the mother.

Actæa is said to be useful in preventing after-pains, and after delivery to expel the placenta from the cavity of the uterus; but ergot is preferable, as it produces more persistent contractions. It has been recommended in amenorrhœa, dysmenorrhœa, and in menorrhagia. It certainly does control menorrhagia, although it is inferior to other remedies.

Again, when from cold, shock, or mental emotion, the menses are suddenly checked, or when, from similar circumstances, the lochia are suppressed, distressing symptoms are apt to occur, as more or less severe pain in the head, in the back, and down the legs, stiff sore muscles, and bearing-down pains. It is said that actæa racemosa will restore the secretions, and remove these symptoms.

The same remedy has been given to prevent miscarriages in irritable uterus and prolapsus uteri.

Actæa is said to be serviceable in that common and distressing headache occurring in nervous hysterical women, especially at the menstrual period, or when the flow is too frequent and too profuse, or at the change of life.

The pleurodynia dependent on uterine derangements is also enumerated among the many troublesome complaints over which actæa is said to prevail.

During pregnancy and after confinement women sometimes suffer from great mental disturbance, sometimes amounting to madness. In such cases actæa is said by Sir J. Simpson to be highly beneficial. (See Bromide of Potassium.)

Actæa has been given to relieve the headache arising from overstudy or excessive fatigue.

The tincture, made in the proportion of four ounces of the plant to a pint of proof spirit, is the form in which this medicine is generally employed. Five minims may be given every hour, or fifteen to thirty minims three times a day.

ACONITE AND ITS PREPARATIONS.

Perhaps no drug is more valuable than aconite. Its virtues are only beginning to be appreciated, but the author ventures to predict that ere long it will be extensively employed.

Aconite is used externally in the form of liniment or ointment, to relieve pain. In the neuralgias of the brow or face, these applications are sometimes of the greatest use, and often relieve the distressing pain either permanently or temporarily. While in many instances they give immediate and permanent relief, yet it must be confessed that in a large number of cases the pain is unaffected. With our present knowledge, we are unable to predict, with any certainty, the cases in which aconite will succeed or fail. This much, however, is clear, that those neuralgias depending on decayed teeth, diseased bone, or on tumours pressing on nerves, are beyond the control of aconite; but these are not the only forms of neuralgia which will not yield to aconite. In some instances, no doubt, failure can be explained by the badness of the preparation. As no harm can follow the employment of aconite externally, it should always be tried; and if unsuccessful, then recourse can be had to other modes of treatment. If aconite succeed at all, it will succeed at once; hence, if relief does not come speedily, it is useless to continue it. The preparation should be sufficiently strong to produce decided numbness and tingling in the skin.

A piece of the ointment, the size of a bean or nut, should be applied with friction, which enhances its efficacy. This quantity should be repeated until it induces a sensation of tingling. The liniment, applied with a brush, should be mixed with an equal quantity of chloroform liniment to assist absorption. While using these powerful poisonous applications, care should be taken not to rub them into wounds or cracks of the skin, and to avoid contact with absorbent tissues, as mucous membranes and the conjunctiva. Spinal irritation, and intercostal neuralgia, and sciatica, in many instances, yield to aconite ointment; but spinal irritation and intercostal neuralgia yield more readily to belladonna preparations.

Given internally, aconite at first induces a sensation of warmth at the pit of the stomach, sometimes with nausea and vomiting. The sensation of warmth spreads over the body, and there is soon perceived tingling of the lips, tongue, and adjoining parts: the uvula, with the tongue, feels as if it were swollen and too large for the mouth, and deglutition is frequent. A large dose induces tingling and numbness at the tips of the fingers, thence spreading over the whole body, and accompanied by diminished sensibility and some muscular weakness, which, if the dose was very large, becomes extreme, and is one of the most prominent and important symptoms of the drug.

The action of aconite on the circulation and respiration is most noteworthy. Moderate doses greatly reduce the number of the heart's beats, even to 40 or 36 in the minute; but after a larger and dangerous dose the pulse becomes more frequent, and may become irregular; even a small quantity of the medicine sometimes excites irregular heart action. Whether the frequency is increased or lessened, the pulse always loses strength, showing retardation of the circulation. The effects on respiration are very similar. Moderate doses make the breathing slower; but a large and poisonous quantity often makes it short and hurried.

During the administration of aconite, cutting pains are often complained of in the joints and other parts of the body. An eruption of itching vesicles sometimes breaks out on the skin. Delirium occurs in some cases, but after fatal doses the mind often remains clear to the last. Blindness, deafness, and loss of speech occurred in some fatal cases. The muscular weakness produced by this drug is extreme, and frequent faintings occur. Death from aconite appears to be due to syncope. As aconite diminishes sensibility, it has been used internally in various painful diseases; but for the most part other remedies have superseded it for the relief of pain.

Aconite is to be the most esteemed for its power, little less than marvellous, of controlling inflammation, and subduing the accompanying fever. It will sometimes at once cut short an inflammation. It will not remove the products of inflammation, but by controlling the inflammation it prevents their formation, so saving the tissues from further injury. It is therefore in the early stage of inflammation that this plant is conspicuously serviceable: still, although the disease may have advanced to some extent, and injured the organs by the formation of new and diseased products, yet while the inflammation is extending aconite does good. Its good effects are often visibly apparent in pharyngitis, tonsillitis, etc.

The results of aconite are most apparent when the inflammation is not extensive, or not very severe, as in the catarrh of children, or in tonsillitis, or in acute sore throat. In these comparatively mild diseases, especially if the aconite is given at the earliest stage, when the chill is still on the patient, the skin in a few hours, which before was dry, hot, and burning, becomes comfortably moist; and, in a little time longer, is bathed in a profuse perspiration, often so great that drops of sweat run down the face and chest, and with the sweat comes speedy relief from many of the distressing sensations, as restlessness, chilliness, heat and dryness of the skin, and aching pains and stiffness. At the same time the quickened pulse is much reduced in frequency, and in a period varying from twenty-four to forty-eight hours both pulse and temperature reach their natural state. A quinsy or sore throat, if caught at the commencement, rarely fails to succumb in twenty-four to forty-eight hours. After the decline of the fever the sweating may continue for a few days on slight provocations.

The appearance of the inflamed part exhibits too, in a striking manner, the beneficial effects of the drug. Thus large, livid, red, glazed, and dry tonsils, if the medicine has been given before the formation of much lymph, will in twenty-four hours present that appearance which indicates the subsidence of the acute stage of inflammation; namely, the swelling and most of the redness will disappear, and the mucous membrane become moist, and bathed with mucus or pus. If just at this stage we apply some strong astringent, as glycerine of tannin or nitrate of silver, it will remove most of the remaining diseased appearance and the pain, if it continue. Such are the visible effects of aconite on inflamed tonsils, etc. To those who may not have tried it, these statements may seem exaggerations, but they may be witnessed by any one who will employ the aconite in the way to be immediately mentioned.

Its effects on catarrhal croup are as conspicuous. It removes the urgent dyspnœa in a few hours, and in a short time longer subdues the fever. Aconite is equally serviceable in severe colds, with much chilliness, great aching of the limbs, a hot, dry skin, and quick pulse.

In pneumonia, pleurisy, and the graver inflammations, the effects of this valuable drug, though not so rapid, are equally manifest.

In pericarditis, accompanied with violent throbbing and extreme pain, aconite will speedily quiet the undue action, and so relieve the pain.

Most observers ascribe its influence on inflammation to its power over the heart; and, as they truly point out, the remedy is of most use in the sthenic forms of disease; and where there is great weakness, and the heart beats feebly, unless care is taken, it may do harm. The method of employing the drug has much to do with its success. As already said, it should be given, where possible, at the very beginning of the disease. The use of the medicine should never be delayed; every hour is of importance. Half a drop or a drop of the tincture, in a tea-spoonful of water, should be given every ten minutes or quarter of an hour for two hours, and afterwards continued hourly. If there is much prostration, with feeble and weak pulse, a still smaller dose should be given.

We feel constrained to point out here the signal service rendered by the thermometer in enabling us to decide whether aconite should be given or not. Indeed, in the treatment of inflammations, the thermometer and aconite should go hand-in-hand. When called to see a patient, if the symptoms and physical signs are not sufficiently developed to decide whether an acute inflammation of some deep-seated part has set in or not, this instrument will often decide the doubt. No acute inflammation can exist without preternatural heat of the body. Hence if, in a doubtful case, the temperature, after a careful investigation, is found natural, the case is not one for aconite; while, on the other hand, if the other symptoms doubtfully indicate an inflammation, a rise in the thermometer will add considerably to the probability of an inflammation, and will indicate the advisability of employing aconite. Sometimes the throat is swollen very red, and presents the appearance of an ordinary sore throat, accompanied by fever, but fever is absent. Without the thermometer these two kinds of inflamed throat cannot be discriminated with certainty. The non-febrile form is affected very little, if at all, by aconite. A want of discrimination between the two forms has often led, no doubt, to the mistaken use of aconite, so bringing discredit on this valuable drug.

Again, the use of the thermometer after scarlet fever is very important; for, as is well known, acute inflammation of the kidneys is then liable to occur, the first onset of which would at once be indicated by a rise in the body temperature. It is well therefore, during the convalescent stage, to direct the nurse to take the temperature night and morning; and if this should rise beyond the healthy standard, she should at once give aconite, so as not to allow some hours to elapse before the patient can be seen by the medical attendant. The fever, it is true, may depend on some other cause than inflammation of the kidney; but even then it will probably be inflammatory in character, arising from gastric catarrh, over-feeding, and the like, and in any case aconite is indicated.

It is doubtful whether aconite will shorten the fever of acute specific diseases, as scarlet fever, measles, etc., but it has a beneficial influence in these diseases, soothing the nervous system, and favouring sleep, by inducing free perspiration. Whether this remedy can lessen the severity of the fever, or diminish the duration of the acute specific diseases, is doubtful; but there is no doubt it can control and subdue the inflammatory affections which often accompany them, and which by their severity may endanger life. Thus aconite will moderate, but neither prevent nor shorten, the course of the inflammation of the throat in scarlet fever, and the catarrh and bronchitis in measles, and in this indirect manner lessen the height of the fever.

In certain epidemics of febrile inflammatory sore throat, which not uncommonly occur, aconite proves useless. These cases are met with chiefly during the prevalence of scarlet fever. The throat is much swollen, and of a very dusky red colour; the pulse very frequent and very weak. There is great prostration, and the symptoms are of a marked typhoid character. Here stimulants, with the application of a strong solution of nitrate of silver, do most good.

Aconite is of marked service in erysipelas. Administered at the commencement, it often at once cuts short the attack; and even when the disease continues in spite of it, aconite will reduce the swelling and hardness, lessen the redness, and prevent the inflammation from spreading.

In children, after vaccination, perhaps when the spots have nearly healed, an erysipelatous redness occasionally appears, spreading over the arm and a great part of the trunk, usually ceasing in one part, and then successively attacking contiguous parts, and leaving a yellow discoloration and desquammation. The redness is often intense, the tissues very hard, painful, and shiny. This inflammation may continue for weeks. It may run down the arm, involve the hand, and implicate the greater part of the chest; or it may appear in the leg, and gradually spread to the foot; or, again, it may spread from the hand up the arm, and once more down to the hand, and this may be repeated many times. Sometimes the inflammation terminates in small abscesses. In such cases aconite generally at once arrests the inflammation; and even when it persists, the redness is rendered less intense, and the swelling less hard and painful. The troublesome inflammation arising often after vaccination of adults generally yields to aconite, especially if supplemented by the local application, twice daily, of belladonna ointment.

In the treatment both of simple inflammations and acute specific diseases, aconite may be appropriately administered in conjunction with any other remedy which may be indicated.

Aconite has been much praised by eminent authorities in the treatment of acute rheumatism, and there can be no doubt of its usefulness; still its good effects are not so apparent as in acute inflammation. Acute rheumatism having no regular course or duration, untreated, may last only a few days, or endure for many months. It is difficult, therefore, to decide whether, in some cases, the speedy decline of the fever is a natural decline, or due to the aconite. It is certainly ineffectual in many cases, which appear to run their course uncontrolled by this drug; so that it is still required to determine in what class of cases it is useful, and in what class of cases it is without effect. In one respect it often appears to be of service, that of subduing the pain from inflamed and swollen joints.

Gouty pains are said to yield to this remedy, and in many instances it has been given in neuralgia, apparently with good results.

It has been elsewhere shown that aconite lessens the rapidity of the circulation. It may therefore be used in all cases where it is needful to subdue vascular excitement. In fact, it may be given in precisely those cases which were formerly treated by bleeding.

When the menses are suddenly checked, as by cold, this remedy may be given with advantage. It will often restore the flux, and so remove the distressing and peculiar train of symptoms produced by arrested menstruation.

The "fluttering at the heart" of nervous persons, and also nervous palpitations, generally yield to this remedy. More general treatment is usually required; but when the conditions causing the disturbance are undetectible or irremovable, then aconite may be usefully employed.

The acute stage of gonorrhœa may be satisfactorily treated by a drop of tincture of aconite each hour; and it is even said to remove chordee.

DIGITALIS AND ITS PREPARATIONS.

LARGE doses of this drug excite nausea, vomiting, and diarrhœa; the matters voided both ways being of a grass-green colour. This colour is produced by the action of the gastric juice on some constituent of the digitalis. These symptoms and appearances may follow even a medicinal dose.

The digitaline passes unchanged and readily from the intestines into the blood; for the same phenomena ensue whether the alkaloid is injected into the veins, or is swallowed.

The action of digitalis on the heart is the most noteworthy, and our knowledge of its influence on this organ, either healthy or diseased, is becoming daily more exact.

Drs. Fagge and Stephenson have published some interesting and important investigations concerning the influence of digitalis on the frog.

"Its effect on the frog is the production of irregularity of the heart's action, followed by complete stoppage of the pulsations, the ventricle remaining rigidly contracted and perfectly pale after it has ceased to beat, the muscular power of the animal at the time being unimpaired, and persisting as long as in frogs in which the circulation has been stopped by other means, such as ligature of the heart. The irregularity of the heart's action, which precedes its stoppage, under the influence of the poison is peculiar. The rhythm is but little altered, and the beats are not necessarily diminished in number, as has been supposed. Sometimes, however, the ventricle makes only one pulsation for two of the auricles, the number of its contractions being therefore lessened by one half." [There is nothing peculiar in this.] "More frequently the irregularity consists in one or more portions of the ventricle (especially the apex) becoming rigid, white, and contracted, while the remainder of the organ continues to dilate regularly. When the yielding portions are small, a peculiar appearance, as if the wall of the ventricle formed crimson pouches or protrusions, is produced." *

In these experiments the digitalis certainly did not weaken but strengthened the heart's contractions, and at last tetanized this organ. At the same time the contractions were rendered peculiar and irregular.

Two other experimenters, Eulenberg and Ehrenhaus, have ascertained the influence of solutions of digitaline applied directly to the frog's heart after its separation from the body. The still pulsating heart, when partly submerged in a solution of digitaline, composed of one-fourth of a grain of the alkaloid to the ounce of water, had its contractions increased in force, but every now and then there occurred a pause in its beatings.

With a still weaker solution (gr. i. to ℥viii.) the same occurrences were observed. The pulsations grew fewer and fewer, while the duration of each contraction was proportionately lengthened. The heart continued to pulsate two hours and a half.

From these investigations it appears that digitaline strengthens the contractions of the heart, and prolongs the systole, while it does not at all shorten the time the heart usually continues to contract after its removal from the body.

Dr. Nunneley has made numerous observations on the action of digitaline on frogs. The following is a summary of what he has observed, in his own words :—

"The physiological action of digitaline on the heart of the frog would appear to be widely different from its therapeutical action on the dilated and weakened human heart in disease. In the former case the heart is thrown into violent and disorderly contractions, which quickly end in a cessation of movement.

* These authorities point out that "upas antiar, helleborus viridis, and perhaps other species of helleborus, the Tanghinia venenifera, the dajaksch, the carroval, and scilla maritima influence the heart in the same way."

"In the latter, clinical examination of the heart and pulse appear to show an increase of contractile power, and a restoration of its regular performance.

"1. The first visible effects on the heart occur a short time after the injection of a moderate dose under the skin of the frog, and consist in a diminished range of the heart's movements, whilst the organ itself appears somewhat shrunken. The most marked alteration, however, is a certain embarrassment and want of smoothness in the contractions, as if the separate muscular fibres acted with undue energy, but in an irregular manner, or as if there was a want of co-ordination in the contractions of the individual fibres.

"2. The heart does *not* contract with greater frequency after a dose of digitaline, and no change at all occurs in this respect until its action becomes embarrassed, when the frequency of pulsation is diminished, and does not again increase.

"3. The ventricular systole is lengthened, but it presents a very different appearance to the systole in health. The ventricle seems no longer to act as a single large muscle, but as if made up of numerous small ones, which contract energetically, but in an irregular and disorderly way; hence there are projecting bundles of contracted muscular fibres which give the ventricle a rough and uneven surface and an irregular outline. During the diastole the ventricle does not everywhere assume a red colour, but one or more red spots appear, as if the ventricle were so tightly compressed that only a small quantity of blood could enter it by chance. Sometimes a red spot is elevated a little above the general surface, forming a kind of pouch. These spots become smaller and smaller, until at last the ventricle is left very pale, strongly contracted, and motionless, while the auricles are distended with blood.

"4. The rhythm of the contraction of the three cavities is generally little interfered with. Two contractions of the auricles sometimes occur to one of the ventricles, but often there are also two ventricular contractions, one of them being very slight and transient.

"5. Locally applied to the web of the frog's foot, no effect whatever is produced in the calibre of the small arteries, nor does any alteration in their size occur when it is injected under the skin, until the irregular and more or less persistent contractions of the ventricle diminish the blood stream to which the arteries then to some extent adapt themselves. The primary action of digitaline is thus on the heart.

"Sometimes, after the injection of a dose under the skin, the frog has paroxysms of gasping movements, in which it remains perfectly still, leaning on its fore-paws, which are widely separated, and holding its head up, and opening its mouth widely. Whilst in this state, which lasts from about half a minute to a minute and a half, or more, the frog scarcely notices irritation of its skin, or shaking of the dish containing it, and the mucous membrane of the tongue and mouth are seen to be extremely pallid in consequence of the small quantity of blood sent from the heart. When the paroxysm has passed off, the frog jumps about with energy. It is worthy of remark that whilst the embarrassment to the action of the heart is continuous, the gasping movements are paroxysmal, as in human beings where the cardiac dyspnœa occurs in fits, whilst the condition of the heart remains constant. The posture and appearance of the frog are chiefly noticeable, however, from the vivid picture they present of extreme and urgent dyspnœa."

It thus appears that all these experimenters agree in the main as to the action of digitalis on the frog's heart.

How this drug affects the healthy human heart has not yet been satisfactorily settled, since the statements of various authorities are on some points contradictory. All observers agree that under its influence the heart's beats are almost always very much reduced in frequency; and when very large and poisonous doses are used, the pulse becomes weak, frequent, and intermittent. But by some observers it has been maintained that the heart is first quickened in its contractions, an assertion denied by others. On the diseased heart digitalis often acts with conspicuous advantage and its good.

Effects are most apparent in cardiac dropsy; but it is not suited to all forms of this disease; for the heart complaint, on which dropsy may depend, is not always of the same kind. Thus the dropsy may be due to dilatation of the ventricles, or to some disease where this condition does not exist. Moreover the dilatation may be limited to the right, or it may be most marked in the left ventricle. If on the right side, it may be owing to obstruction to the free passage of the blood, as in the lungs from emphysema and bronchitis, or from a disease of the mitral valves, which obstruction causes the right ventricle to become engorged, and so distended that its valves are made incompetent, and tricuspid regurgitation, with its consequent, dropsy, results. Or the dilatation may be mainly or entirely limited to the ventricle of the left side, and be due to aortic or mitral disease, or to both. Further, extreme dilatation, with a good deal of hypertrophy of the left ventricle, not unfrequently occurs with a murmur having the characters of a mitral regurgitant one, independently of any disease of either the mitral or aortic valves. With all these and some other forms of heart disease, extreme general dropsy may occur; but it is in the highest degree important to recollect that digitalis is not equally capable of doing good in all these different diseases, and that a careful discrimination must be made, or the employment of this drug will very often lead to great disappointment to the practitioner, and, it may be, harm to the patient. For while digitalis, in some forms of heart disease, will remove most of the symptoms, even of the gravest character, it will accomplish little or nothing in other forms.

It is now proposed to pass in review those kinds of heart disease which may be benefited by digitalis, and those also which are but little if at all influenced for good by this medicine.

With a patient presenting the following symptoms and physical signs digitalis will be found of eminent service. There is dropsy, which may be extensive; the breathing is much distressed in the earlier stages of this condition only periodically, and especially at night; but when this reaches its worst stage, the breathing is continuously bad, although it becomes paroxysmally worse. The patient cannot lie down in bed,* and is perhaps obliged to sit in a chair, with the head either thrown back, or more rarely leaning forward on the bed or some other support. The jugular veins are distended, and the face is dusky and livid. The pulse is very frequent, feeble, fluttering, and irregular. The urine is very scanty, high-coloured, and deposits copiously on cooling. The heart is seen and felt to beat over a too extensive area; and the chief impulse is sometimes at one spot of the chest and sometimes at another. The impulse is undulating, and the beating very irregular and intermittent. The physical examination betrays great dilatation of the left ventricle, with often a not inconsiderable amount of hypertrophy. There is mostly heard a murmur, having the characters of one produced by mitral regurgitant disease, and there may be also disease of the aortic valves.

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* These patients, and those who suffer much from oppression of the breathing from other diseases of the heart, are often, on account of the dyspnœa, unable to sleep, and become much exhausted and wearied out. By the hypodermic injection of small quantities of morphia (one-sixth or one-twelfth of a grain) the dyspnœa may

A case presenting these symptoms and physical signs will very generally respond quickly to digitalis, if given in the following way. In all treatment, the object must be to obtain the greatest therapeutic effects with the smallest possible dose of medicine. This is particularly important with a powerful drug like digitalis; for large doses often appear to increase the embarrassment of the heart, and relief is obtained only when the dose is diminished. Further, it is important not to give a larger quantity of the medicine than is necessary, as it is very likely the patient may require its use for a long period; for in such a case as above described the patient after a time becomes accustomed to the medicine, and the dose which at first did good seems to partially lose its effect, when a larger quantity is required; but this could be given only with the greatest caution, and even with some danger, if the maximum quantity had in the first instance been employed. The importance of these remarks cannot be underrated, should it prove, as has been asserted, that digitalis is a cumulative poison. It is further important to keep the dose of digitalis as small as possible; otherwise, after the medicine has been continued for some time, it may produce general convulsions, generally ending in death.

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be much quieted, and sleep more or less refreshing obtained. This treatment may be adopted without fear of any disagreeable consequences. Since this foot-note was written, Dr. Allbutt, in the *Practitioner*, has recommended this treatment, long since employed by the author and many others.

The writer believes that the form of the preparation has much to do with the success of the drug. The infusion, fresh and well made, will generally give far better results than the tincture. It is advisable to begin by using a drachm of the infusion twice, or not more than three times, a day. In many instances this will be enough. The effects on the pulse, the urine, and dropsy, are to be carefully watched. Under the influence of this medicine, when properly given, the pulse grows much stronger, more regular, and much slower, till, in very many cases, all irregularity ceases, and it becomes natural in frequency and rhythm. At the same time the urine, which previously may have been not more than half a pint in the twenty-four hours, increases to one, two, four, or even eight pints a day. With this increase, and in proportion to it, the dropsy diminishes till it disappears. Should the influence of the drug be small or unnoticeable, the quantity in a few days may be increased; but it must be remembered that the good effects of digitalis may not become apparent till three or four days have elapsed. A drachm may be given every three or four hours, as circumstances indicate, or one drachm may be given in the morning, two in the middle of the day, and two at night. Should the symptoms resist this additional dose, another increase must be made in a few days. It not uncommonly happens that a small dose at first succeeds admirably, and removes much of the dropsy, but fails to effect all that is desired; when an increase in the quantity of the medicine must gradually be made.

The cases which we are now treating of require in most instances the free administration of alcoholic stimulants, and the best of these, on account of its diuretic action, is gin.

When a patient with the above-mentioned symptoms dies, the *post-mortem* examination reveals great dilatation of the left ventricle, with very generally much true hypertrophy of its walls. Sometimes there is incompetence of the aortic or mitral valves, or of both; but by no means uncommonly both these sets of valves are healthy, and admit of no regurgitation when tested with water, although during life a murmur of a mitral character had existed.

Digitalis will be found especially useful when there is much dilatation and hypertrophy of the left ventricle without any valvular disease, although a mitral murmur may have been heard during life; but unfortunately it is at present impossible in many cases to decide before death whether there is mitral disease or not.

It has been asserted by eminent authorities, that in aortic disease digitalis is worse than useless, and will embarrass still further the heart, and increase the difficulty of breathing; but after a prolonged and careful investigation of this question the author is convinced that, in a case presenting the physical signs and symptoms above enumerated, the existence of aortic disease, whether obstructive or regurgitant in character, or both, does not in any degree contra-indicate the employment of digitalis.

Of the indications above mentioned, the irregularity of the pulse is the most important, and is the one which most decidedly calls for this medicine.

Earlier stages of the above disease are not unfrequently met with, when the symptoms, though troublesome, are not yet very severe. These forms are not uncommonly seen in children who some time previous have had rheumatic fever. In such patients the heart gives evidence of great dilatation and hypertrophy of the left ventricle, whose impulse is strong and heaving. There is generally a systolic apex murmur (mitral), with perhaps systolic apex thrill. At first these patients are only troubled with palpitation on exertion; but after a variable time—it may not be till after many years—paroxysms of palpitation, accompanied by urgent dyspnœa, occur, and are perhaps so often repeated, that the child cannot lie down at night, and is obliged to be propped up with pillows. In a further stage of the complaint the dyspnœa is continuous, but becomes paroxysmally worse, and the child is unable both night and day to assume a horizontal position. The pulse in all these stages of the disease is ordinarily quite regular, but is generally very frequent and feeble, although the heart at the same time throbs violently against the chest. There is no dropsy, or it is slight and transient, appearing for a few days, and then passing away, till for some reason the heart again becomes more embarrassed.

All these symptoms are often speedily removed, and in consequence the comfort and general well-being of the patient greatly promoted, by digitalis. Under its influence the tumultuous strongly beating heart grows quiet, and contracts less forcibly, while at the same time the pulse grows less frequent and much stronger.

In cases such as we have just described, two important circumstances may be frequently witnessed; the pulse may be very weak and feeble, while the heart contracts with unnatural strength; and while the digitalis strengthens the pulse, it subdues the unnatural force of the heart's beat.

The first of these circumstances is of importance, as it is commonly concluded, in the cases now treated of, that the weak pulse indicates a correspondingly weak heart, whence it has been concluded that, as digitalis is eminently suited for these cases, it is useful when the heart is feeble. Such a conclusion is certainly erroneous; for, as has been said, while the pulse is very weak, the heart can be felt to strike the chest with a very considerably increased force; and further, when these patients die, the left ventricle is found very considerably dilated, it is true, but also very considerably hypertrophied.

This want of correspondence between the pulse's strength and the heart's contraction becomes still more apparent when these patients are seized with an attack of palpitation. The heart then sometimes beats with sufficient strength to make its movements visible through the clothes, or even to shake the bed, yet at the same time the pulse is felt to be very small and feeble. Where this discrepancy between the vigour of the heart's contractions and the strength of the pulse is permanent, it would appear as though patients were troubled with a perpetual palpitation, which, however, becomes paroxysmally worse. This discrepancy between the pulse and the heart, which may be viewed as a form of irregularity on the part of the heart, digitalis often corrects; and hence, while the heart under its influence becomes quieter in its action, the pulse grows stronger as well as slower, and we have thus an instance in which digitalis controls a too strongly contracting heart.

An early stage of the severe disease which has been depicted may also be witnessed in older people, in whom there is much irregularity of the heart's action, and the pulse is irregular and intermittent. On auscultation a mitral murmur may very generally be detected, and perhaps an apex systolic thrill. These people may suffer from constant dyspnœa; and from attacks of palpitation, during which the embarrassment of the breathing is much aggravated. There is no dropsy, nor lividity of the skin, and the urine is secreted in natural quantity. In such a case, infusion of digitalis in drachm doses, repeated once, twice, or three times a day, will give complete relief, quieting the palpitations, removing the dyspnœa, and regulating the pulse.

If in any of the milder (as also in the severer) forms of these complaints aortic valvular disease exists, such a circumstance is not to be considered an indication against the administration of digitalis.

An important question is, How long can the digitalis afford relief and preserve life? As might be expected, the good results obtained will depend on the more or less advanced stage of the disease. In its earlier stages the relief may be so complete as to permit the discontinuance of the medicine, and the patient may remain relieved for months or many years; but generally occasional returns of the symptoms recur, which may be again and again removed by a fresh recourse to digitalis. Thus life may be greatly prolonged and made useful, although the sufferer is unfit for very arduous work. Even when dropsy has appeared, and has become extensive, great and permanent relief may sometimes be obtained; but in most cases where the disease has much advanced, and has lasted for some time, the relief—although it may be very great, and all the dropsy and dyspnœa may be removed—is of short duration, and the disease, as it were, catches up the medicine, and progresses in spite of it, till it ends in death. It must be received as a bad sign if a considerable dose of the medicine is required to mitigate the symptoms, or when it is necessary to give the medicine in increasing doses to maintain the good effects at first obtained.

Before the remarks on this form of heart disease are concluded, it may be mentioned that if no dropsy is present the digitalis will not considerably increase the quantity of urine, and will not therefore act as a diuretic; for usually where there is no dropsy the urine is excreted in natural quantities.

The following appears to be the history of the progress of the disease above described. At first, from valvular disease, or from some at present unexplained cause, the left ventricle dilates, and as it dilates also hypertrophies. When the dilatation and hypertrophy have progressed in some degree, the heart's impulse becomes strong and heaving, and is felt over an extensive area of the chest, while the patient is afflicted, at first on exertion only, with attacks of palpitation and dyspnœa. Next, as the disease advances, either gradually or suddenly, the impulse becomes still stronger, more extensive, and more heaving, and the contractions are very frequent. At the same time the breathing is permanently difficult, but becomes with each attack of palpitation paroxysmally worse—so bad, indeed, as to give rise to the idea that the patient cannot live through it. In this stage the pulse is frequent, small, and weak, and in strength is altogether out of proportion to the strongly contracting, heaving, tumultuously acting, left ventricle.* As the disease still further increases, to the above symptoms are added irregularity of the heart's action and irregularity of the pulse. With all the foregoing symptoms and physical signs, there is at first neither fulness nor pulsation of the jugular veins, nor any lividity of the face, nor is there any dropsy; but with the further advance of the malady these symptoms arise, and are probably produced in the following way.

In consequence of the irregular action of the walls of the heart and its columnæ carneæ, the mitral valves become incompetent, and permit regurgitation. There may also be disease and incompetency of the mitral valves, with permanent regurgitation from the ventricle to the auricle, which regurgitation will be increased by the irregular action of the heart. This regurgitation causing considerable obstruction to the passage of the blood through the lungs, the right side of the heart becomes distended, and its valves in their turn become incompetent, leading to regurgitation into the veins, to general dropsy, and lividity of the skin.

When the disease has reached its worst stage, the heart's action is so embarrassed that, although its walls are hypertrophied, it strikes with each beat feebly against the chest, and its impulse may be scarcely perceptible.* The pulse is frequent, feeble, irregular, and intermittent.

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* Digitalis controls this too strong action of the left ventricle, and thus affords an instance of its usefulness in a hypertrophied and too powerfully acting heart.

In some cases, and especially with children, the disease may advance to a great degree without the occurrence of any irregularity of the heart's action, but with other patients such irregularity occurs early.

At the *post-mortem* examination—and on such examinations these statements are founded—the left ventricle is found, as has already been stated, very considerably dilated, and very greatly hypertrophied. Often the mitral, and not unfrequently the aortic, valves are more or less diseased, admitting of a variable amount of regurgitation.

For such a heart digitalis will be found of great service. The following explanation of its action is suggested.

By restoring order to the heart's movements, the regurgitation caused by the irregular action of the columnæ carneæ is removed, and regurgitation from the left ventricle to the auricle, and thence through the lungs to the right side of the heart, is prevented. If such be the explanation of its action, then it will remove with completeness the symptoms only when the mitral regurgitation is dynamic, and will fail to remove those which depend on organic disease of the mitral valves. Such, indeed, is the case; and where, as frequently happens, there exists, in addition to irregularity of the heart's action, organic disease of the mitral valves admitting of regurgitation, the digitalis, by quelling the irregularity, will remove so much of the dropsy and other symptoms referable to this condition, but will leave the dropsy, and that share of the symptoms dependent on the organic disease of the valves, unaffected.

The truth of this statement may be verified by cases like the following, which unfortunately too often occur. A patient with dropsy, and with symptoms and physical signs like those just described, is partially benefited by digitalis, and much of the dropsy and dyspnœa is removed, but the medicine is unable to afford complete relief. There is found after death much disease of the mitral valve permitting regurgitation, and the left auricle is in consequence much distended. Such condition of the mitral valves the digitalis of course could not remove, but that share of the dropsy and other symptoms produced by the irregular action of the heart, the digitalis could remove. The truth of these statements may be verified by *post-mortem* examination, combined with clinical observation. Such testing investigations will show that digitalis is useful in proportion to the degree in which the dropsy, etc., are due to irregular action of the heart, and are independent of organic disease of the mitral valves.

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* Digitalis in such a case quiets the heart, removes the embarrassment, and strengthens very considerably each beat. This is an instance in which the medicine strengthens the beats of an apparently weak heart.

Not uncommonly cases of the following kind occur, which may be greatly benfited by digitalis :—A patient (who has been perhaps troubled with slight palpitation of the heart for some years) on catching a cold is attacked with bronchitis, and finds, in consequence, the palpitations much increased. These palpitations in their turn excite severe paroxysms of dyspnœa. The heart may appear healthy, or there may be only a slight mitral murmur. In such a patient the palpitations may be quelled, and the breathing made calm, by digitalis.

This medicine, however, leaves the bronchitis untouched, except that by easing the breathing it indirectly assists expectoration, and by the same means enables the patient to obtain refreshing sleep. In this indirect way digitalis may benefit the bronchitis, but the medicine here acts on the heart; and if with bronchitis much palpitation or irregularity of the pulse occurs, this remedy is indicated.*

Before treating the paroxysmal dyspnœa which may co-exist with bronchitis, it is important to learn if the paroxysms are accompanied by, and depend on, palpitation of the heart; for if so, ordinary antispasmodics, as lobelia, chloroform, or ether, will be without avail. Digitalis is the remedy generally required, and a drachm of the infusion taken twice or three times a day is ordinarily sufficient.

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* If during a fit of palpitation the heart beats very violently, one or two drops of tincture of aconite, given every quarter of an hour, may succeed in quieting it better even than digitalis.

Functional palpitations, and those attacks of palpitation which occur with hypertrophy of the heart,* may be relieved by small doses of digitalis. Here, probably, the palpitations are owing to some temporary aberration of function which the digitalis can set aside. It is certainly wrong to view the palpitations as the result of too much healthy action.

Those forms of heart disease which may produce dropsy, but over which digitalis exerts little or no control, will next be spoken of.

General dropsy dependent on heart disease is in some instances produced in the following way. The lungs degenerate, and become emphysematous, and hence offer obstruction to the free circulation of the blood from the right to the left side of the heart. To meet and overcome this obstruction the right ventricle grows hypertrophied, but only sufficiently so to meet the obstruction offered to the circulation; and, unlike the healthy heart, there is but little reserve power left in this organ; and hence, on the occurrence of any sudden access to the obstruction of the circulation through the lungs, the right ventricle becomes unequal to the task thrust upon it. Such a sudden access of obstruction bronchitis occasionally becomes; and on the occurrence, therefore, of an attack of this disease, the blood, unable to pass through the lungs with sufficient ease, accumulates in the right cavities of the heart, overloads them to distension, till the tricuspid valves become incompetent, and permit of regurgitation from the ventricle to the auricle, and thence into the veins, where, if the obstruction in the lungs is great, dropsy will ensue. In such cases the dropsy varies with the amount of bronchitis; as this increases or declines, so does the dropsy grow greater or less. If the distension of the right cavities lasts a considerable time, then, on the disappearance of the bronchitis, the cavities do not regain their natural size, and the tricuspid incomptency becomes permanent, and the dropsy likewise.

In such a disease digitalis appears to possess very slight if any power to strengthen the heart to overcome the obstruction in the lungs, and it is in consequence without any good influence, unless the heart acts irregularly. Cardiac irregularity, when at all extreme, even without either hypertrophy or dilatation of the left heart, or disease of its valves, adds to the difficulty of the breathing, diminishes the quantity of urine, and produces dropsy, or increases it if from the obstruction in the lungs it is already present. Such irregularity digitalis can remove, and with its removal will disappear that excess of the symptoms which it produced.

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* Aconite is very valuable in such cases.

The inability of digitalis to strengthen the heart, and thus enable it to overcome any obstruction offered in the lungs, is well shown in cases of the following kind. A patient of middle or advanced age, whose heart, acting irregularly, is much dilated on the left side, has suffered in consequence from dropsy, dyspnœa, etc., effects which have been thoroughly removed by digitalis. On catching cold, and on the occurrence of bronchitis, the dyspnœa, lividity, dropsy, etc., return, and it would naturally be inferred that digitalis, having previously removed the same symptoms, would again be of service. But this is not necessarily the case, and a nice discrimination must be made of the circumstances producing the return of dropsy, etc. Such a lapse, if there is much emphysema of the lungs, is not uncommonly due solely to the obstruction in the lungs caused by the bronchitis and emphysema, and is in no way dependent on any effect the bronchitis has produced on the dilated left ventricle. In such a case digitalis can effect no good, but remedies are needed to control the bronchitis. If, however, as is not uncommon, the bronchitis affects the dilated left ventricle, and brings back the conditions which existed when the digitalis did so much good, then a return to this medicine will again afford relief. In deciding the question whether digitalis should be given or not, attention must be directed to the following points. If on the return of the dropsy, etc., fits of palpitation come on, with attacks of dyspnœa, and if the heart is excited to beat irregularly, digitalis is required; but if, on the other hand, although there is hurried breathing and a very quick pulse, the symptoms just mentioned being absent, the patient will obtain no benefit from digitalis.

There are other serious diseases of the heart, inducing dropsy, in which digitalis does no good; and indeed, unless care is taken, may do much harm. This is a concise description of such a case :—

A patient, often in the prime of life, and it may be without any history of rheumatic fever, has suffered for some time, perhaps for many years, from palpitation after exertion. Auscultation reveals an aortic obstructive or regurgitant murmur, or both combined. To overcome the obstruction to the circulation occasioned by the aortic valvular disease, the heart becomes hypertrophied, and this compensation saves the patient from any troublesome symptoms except some palpitations. After a variable time serious symptoms arise, which generally increase rapidly in severity, and in the course of a few weeks or months the patient dies. This aggravation of the disease is denoted by paroxysms of palpitation, accompanied by urgent dyspnœa, which attacks may be occasioned by the slightest exertion, or may occur without any such provocation. Soon the dyspnœa becomes constant as well as paroxysmal, and about this time dropsy in the legs sets in, and rapidly extends till it invades the greater part of the body, and is often in excess in the pleural or peritoneal cavities. During its whole progress, and to the termination of the disease in death, *both heart and pulse beat regularly and without any intermissions*, and the pulse often manifests the characters significant of aortic regurgitant disease. There is no lividity of the skin, but, on the contrary, it is strikingly pale and waxy looking; nor is there any fulness or regurgitation into the jugular veins. In addition to the aortic murmurs, one may exist having the character of mitral regurgitation, but after death the mitral valves are generally found healthy and competent.

The pathological history of such patients appears to be that disease of the aortic valves induces hypertrophy of the left ventricle, thus enabling it to overcome the obstacle to the circulation offered by the valvular affection. While the compensating hypertrophy keeps pace with the disease, the patient is troubled only by the increased action of the hypertrophied heart, and he may live many years in this condition but little incapacitated for work. Continuing in this state for a variable time, at last the disease of the heart may produce serious and fatal symptoms in the following ways, the effect on the circulation in each case being the same.

In one instance the disease in the aortic valves advances with great rapidity, so quickly indeed as to make it impossible for the left ventricle to hypertrophy sufficiently to combat the obstruction to the circulation offered by the aortic disease, whence ensues much derangement of the circulation, on which depend the serious symptoms just detailed.

In the other instance the disease of the aortic valves remains either stationary or progresses very slowly, but the left ventricle undergoes degeneration, sometimes with great rapidity, and becomes consequently too enfeebled to meet the increased work thrust upon it by the diseased aortic valves, whence arises disturbance of the circulation, the setting in of dyspnœa, palpitations, etc., as described in the previous case. Digitalis will do little or no good in cases like these. Sometimes, indeed, it appears to control in a slight degree the palpitations and the paroxysms of dyspnœa; but it happens not unfrequently that the pulse grows both feeble and intermittent, an effect the author has witnessed in a case of great degeneration of the substance of the left ventricle.

Other forms of dropsy, local and general, are said to be amenable to digitalis. Its efficacy is best established in the dropsy occurring after scarlet fever.

This medicine has been employed in the treatment of acute inflammation. Mr. King, of Saxmundham, held that no good was to be done in inflammations, unless with a large dose; and he gave from half an ounce to an ounce of the tincture. He asserted that with such formidable doses he could subdue most inflammations, if attacked at their very commencement, and before the organs involved became disorganized. He administered a dose, and then waited twenty-four hours to watch its effects; and if, at the expiration of this time, the pulse did not become much less frequent or irregular, he repeated the dose. He gave as much as two drachms of the tincture to a child of nine months old.

Vomiting sometimes quickly follows these very large doses. In the course of his extensive use of this drug in these heroic doses, Mr. King never met with serious or dangerous symptoms attributable to it. Aconite, it is believed, will be found far safer and better than these huge doses of digitalis in the treatment of acute inflammation.

In typhoid fever, when the fever is high and the pulse quick, as happens in the second week of the attack, Wunderlich recommends digitalis, asserting that in two or three days the medicine will reduce the temperature of the body by 2° or 3° Fahr., and will slacken the pulse it may be by thirty or forty beats in the minute.

This remedy has been recommended in other fevers.

Digitalis controls epistaxis, hæmoptysis, and menorrhagia. In cases of menorrhagia, not connected with organic disease, this medicine is said to act, independently of the state of the circulation, with greater benefit than any other remedy; and that when organic disease gives rise to this form of bleeding, the efficacy of the medicine is scarcely less manifest, although the advantage may be temporary.

The late Dr. Brinton highly esteemed it in bleeding from the lungs. He stated that it reduced the frequency of the pulse, when the bleeding ceased. The infusion is to be preferred for hæmorrhages, and large doses may be required.

In rare instances digitalis occasions great strangury, with a desire almost incessant to pass water, which act is accompanied by great and painful straining, and in women by strong "bearing-down" pains.

Few remedies are more successful in arresting spermatorrhœa than digitalis. A drachm or two drachms of the infusion twice or thrice daily is generally sufficient. The free application of cold water to the testicles and perineum aids the effects of the medicine. It is a useful practice to let the testicles hang in cold water night and morning for five and ten minutes at a time.

The late Mr. Jones, of Jersey, excited considerable astonishment by the announcement of the good effects he obtained from very large doses of tincture of digitalis in the treatment of delirium tremens. He recommended the medicine to be given in the following way:—Half an ounce of the tincture is to be administered, and, if necessary, repeated in four hours; and should no effect be produced, again in six. If still without effect, the medicine may be continued in two-drachm doses. Mr. Jones says of this treatment, "The pulse, so far from being lowered in force, becomes fuller, and stronger, and more regular, soon after the first dose. The cold clammy perspirations wear off and the skin becomes warmer. As soon as the remedy produces its full effect, sleep for five or six hours commonly follows. Sleep is the guide to the repetition of the dose. No action on the kidneys is evinced by an unusual secretion of urine. Sometimes the bowels are acted slightly on, but not commonly." Mr. Jones never saw any alarming symptoms follow the use of these large doses of digitalis, although he treated in this way about seventy cases of delirium tremens. It would appear that he adopted this treatment only in the severer asthenic forms of delirium tremens.

With regard to this treatment of delirium tremens, the following conclusions appear to be established:—

I. The medicine may be given in the manner directed without danger.

II. That it very often does good, producing speedily, in most cases, refreshing, quieting sleep; and even when it fails to induce sleep, it generally calms undue excitement.

III. That some cases appear to be uninfluenced by the drug.

It yet remains, however, to ascertain what forms of the disease are best treated by digitalis.

There can be no doubt that by this treatment some of the most asthenic cases in which death was confidently expected, on account of the great prostration of strength, have rallied astonishingly, and ultimately recovered. On this point the evidence is too strong to be disputed. Under the influence of digitalis, the weak, rapid, and fluttering pulse has grown strong and steady, the skin comfortably moist and warm, while, with the improvement in the circulation and state of the skin, the general state of the patient has mended. On the other hand, it appears equally certain that the sthenic forms of the disease are also amenable to this drug. In several instances the author has seen this disease yield speedily to these huge doses of digitalis; but on two occasions the patients suddenly fell back dead, although, to the moment of their death, they had given no warning of this sudden and untoward termination. Whether in these instances death was to be ascribed to the digitalis or to the disease, it is impossible to say; for it is well known that delirium tremens, when treated in other ways, sometimes suddenly ends in this fatal manner.

TOBACCO.

A POULTICE of tobacco leaves is said to relieve pain, and an ointment made by boiling half an ounce of tobacco in eight ounces of lard, kept constantly applied to the breasts, is said to arrest the secretion of milk. In this respect it is probably inferior to belladonna (*vide* Belladonna).

As several deaths have been caused by the application of tobacco to the abraded skin, it must be applied externally with caution.

Tobacco dilates the pupil when introduced into the eye, or when taken by the stomach.

Tobacco produces nausea and sickness, accompanied by great weakness and faintness. It confuses the ideas, dims the sight, enfeebles the pulse, and makes the skin cold and clammy. Owing to the prostration, it removes spasm; and tobacco in the form of clyster, or administered by the stomach, has been employed in colic of the intestines, and in strangulated hernia; but in spasmodic diseases it is quite superseded by chloroform. Tobacco-smoking excites an abundant secretion of saliva. Hence some persons maintain that tobacco-smoking aids digestion. Smoking acts on the intestines as a slight purgative, and there is no doubt that a pipe or cigar smoked after breakfast is often sufficient to ensure an easy and satisfactory relief of the bowels. Hence this practice may be advantageously adopted by persons troubled with habitual constipation.

Smoking in excess is, no doubt, a very harmful habit; it disorders digestion, greatly lessens the appetite, produces much restlessness at night, with disagreeable dreams, and weakens both mind and body. Chronic pharyngitis, the mucous membrane looking like dirty-red velvet, with constant hawking, and also chronic dyspepsia, may in some instances be clearly traced to smoking in excess. Even amaurosis is said to be sometimes produced by excessive smoking. The habitual smoker has generally a thickly coated tongue. The symptoms produced by excessive smoking soon cease when the habit is discontinued. The evil consequences are much less marked if the tobacco is of good quality, and contains but little nicotine. In the cultivation of the tobacco plant, it is a point of importance to develop much of the aromatic principles, and but little nicotine.

At present it has not been satisfactorily determined what structures tobacco affects. Kölliker teaches that (1) nicotine quickly paralyzes the brain, and destroys voluntary movement; (2) that it excites the medulla oblongata and the cord, producing tetanus, which continues only a short time, and is unaccompanied by increased reflex irritability; (3) that the motor nerves are paralyzed, and if the tetanic movements are severe they assist to produce this paralysis; (4) that the sensory nerves do not appear to be affected by nicotine; (5) that the heart continues to pulsate long after nicotine poisoning; (6) that the muscular irritability is unaffected by nicotine. Other observers teach that nicotine feebly paralyzes the motor nerves, and destroys muscular irritability.

Nicotia appears to tetanize the heart; for when this organ has ceased to contract after death, from a mechanical cause, on the direct application to it of nicotia the pulsations recommence, and the heart soon becomes rigidly contracted—tetanized, in fact—and then, of course, the beating again ceases. In birds and mammals killed by chloroform, when the ventricles are immobile and dilated, and respond most imperfectly to stimuli, a drop of nicotine, directly applied, immediately occasions strong contractions in the heart, and causes the organ to respond energetically to mechanical and galvanic stimuli.

The experiments of Fraser and Brown show that nicotia, like other tetanizing substances, when converted into ethyl or methyl compounds, as strychnia, brucia, thebaia, codeia, and morphia, loses its tetanizing properties; but, unlike these, the methyl and ethyl compounds of nicotia do not possess any paralyzing action on motor nerves. This difference inclines them to believe that the convulsions of nicotia are not produced in the same way as those arising from strychnia, brucia, thebaia, etc.

Nicotine has been highly praised in tetanus, and many recorded cases appear to show its usefulness in this very fatal disease. Mr. Curling considers it the best remedy. It must be administered either by the rectum or hypodermically; for when put into the mouth, it very generally excites a severe paroxysm, which, by firmly fixing the muscles of the chest till asphyxia is produced, may destroy life.

Tobacco-smoking commonly affords some relief in spasmodic asthma. Like all other asthmatic remedies, it succeeds much better in some instances than in others.

Whether the active principle of tobacco is destroyed in the system, or is eliminated with any secretion, is at present unknown.

Nicotine is supposed to be diuretic, but we are not told under what circumstances.

CONIUM AND ITS PREPARATIONS.

The statements of the physiological action of this medicine, made by various observers, coincide in the main; but they contain a few contradictions which cannot at present be explained.

We are chiefly indebted to Christison, Schroff, Kölliker, and Guttmann for our knowledge of the action of this medicine.

Paul Guttmann, who has lately published some excellent investigations on the action of this alkaloid, says it is one of the most active and powerful poisons, being in this respect scarcely second to prussic acid; yet some vegetable-feeders, as the goat, sheep, and horse, are said to eat hemlock with impunity.

This medicine exerts no influence on the unbroken skin, even when applied in large quantities; but strong preparations applied to wounds excite inflammation, with its usual accompaniments of heat and pain.

The preparations, or the pounded leaves, or the expressed juice smeared over a poultice, ease the pain of ulcers both simple and malignant, and at the same time improve the character of the sore. The pain-easing property of hemlock rests on the evidence of highly competent observers, and cannot be gainsayed; yet this remedy is now rarely employed for this purpose, although formerly it was in constant use as a soothing application to broken cancers and malignant sores.

The alkaloid, whether directly applied to the eye, or swallowed, causes dilatation of the pupil, sometimes with subsequent contraction. According to Harley, the dilatation is never very great.

The smell of conium has been compared to the urine of cats and mice. It has a burning, acrid taste, provoking an increased secretion of saliva. Conia, dissolved in alcohol, introduced into a hollow, painful tooth, has been employed to remove toothache.

Hemlock has scarcely any influence on the stomach and intestines. It may produce nausea, vomiting, and diarrhœa; but such occurrences are not common. Walshe has seen it useful in relieving the pain of cancer of the stomach.

That conia enters the blood is proved by the symptoms arising when it is swallowed; but what physical or chemical changes, if any, it produces in the blood are at present unknown. Added to blood after its removal from the body, it produces in it no perceptible alterations.

The deficient coagulation and dark colour of the blood noticed by some observers after death from this drug, is according to others often absent; and when present, is probably due to the fatal asphyxia.

The effects of conium on man and animals is very similar. The best account of the symptoms occurring in a human being from a poisonous quantity of the plant, is given by Dr. H. Bennett, who has recorded the case of a man who ate hemlock in mistake for salad. Weakness of his legs, so that his gait was faltering, was first noticed. As the weakness increased he staggered, as if drunk, and at the same time his arms began to be similarly affected. Perfect loss of all voluntary movement followed, and he was unable even to swallow. Lastly, the muscles of respiration were slowly paralyzed, and he died of asphyxia. Up to his death his intelligence was apparently unaffected, but his sight was destroyed. Slight movements in the muscles of the left leg took place.

The same, or nearly the same, sequence of events happens in animals poisoned by hemlock. With rabbits, however, early and severe convulsions occur. In frogs these are absent. In all the experiments and observations of Guttmann, gradual paralysis of the voluntary muscles, and then of the respiratory muscles, took place. The paralysis began first in the hind extremities, affected next the anterior, soon afterwards the muscles of the trunk, and lastly those of respiration.

How this paralysis is produced will be next considered. It is to Kölliker and Paul Guttmann we are indebted for most of our exact knowledge on this subject.

The paralysis is certainly not due to the action of the hemlock on the muscles; for an animal completely paralyzed by conia to such an extent that galvanic irritation through the nerves entirely fails to excite contractions, yet if the current is made to pass through the muscles themselves, energetic contractions are excited. Nay, further, the irritability of muscles through which blood poisoned with conia has been permitted to flow is as great and as enduring as that of muscles of the same animal protected from the action of the poisoned blood by a ligature of the blood-vessels.

Nor does hemlock paralyze by its effect on the spinal cord. For if a limb is protected from the influence of the poisoned blood by ligature of both its artery and vein, and the animal (frog) is then poisoned and thoroughly paralyzed by conium, it can still manifest powerful movements in the ligatured limb. Moreover, irritation of any of the paralyzed parts is answered by energetic contractions in the ligatured limb.

This last experiment greatly narrows the question before us; namely, Through what tissues does hemlock paralyze?

In this experiment the only muscles which retained their power of movement were those protected from the poisoned blood by the ligature of the vessels; and it follows that conia operates on some of the tissues thus protected, that is, either on the nerves or muscles. It follows as conclusively that the paralysis is due in no respect to the action of the poison on the brain or cord; for these parts were freely supplied with poisoned blood, while their nervous communication with the ligatured leg was intact, and yet this limb remained quite uninfluenced. We have, therefore, to decide whether conia affects nerves or muscles; but this question has been already answered when it was proved that the poison exerts no influence on the contractility of muscle.

The investigation may be carried a step further; for it can be shown that the poison affects the periphery of the motor nerves earlier than their trunks. An experiment of Guttmann's proves this.

The leg of a frog, after the vessels leading to it had been tied, was separated from the trunk, except by the chief nerve, and the animal was then poisoned. The uninjured limb, in free vascular communication with the trunk, the extremities of the nerves being exposed to the action of the poisoned blood, became quickly paralyzed, while at the same time contractions through the femoral nerve were easily produced in the limb protected from the poison by its partial separation from the body. In this experiment the main trunk of the nerve of each leg was equally subjected to the poison, but the termination of the nerve in one instance was exposed to the poison, but in the other was protected from its influence. The paralysis, as we have seen, occurred speedily in the limb whose peripheral nerves were subjected to the poison, showing that the primary action of conia is exerted on the terminations of the nerves. But ultimately the trunks themselves become paralyzed; for, in the above experiment, after a time the partially severed limb became paralyzed below the point of section, even when the trunk of the nerve exposed to the poison was irritated.

Are the sensory or afferent nerves in any way affected? Apparently not, as they can certainly convey to the cord or brain afferent impulses in an animal rendered quite motionless by the poison.

The following experiment shows this:—If the legs of a frog are protected by a ligature of both arteries and veins, and the animal is then completely paralyzed by conia, energetic movements can be excited in the ligatured limbs by irritation of the paralyzed parts. Whether these movements are purely reflex, or whether they are voluntary, and are occasioned by pain, it is in this case impossible to decide; but at all events this experiment conclusively shows that in frogs the afferent nerves of completely paralyzed parts can convey impulses to either the cord or brain. When the paralyzed parts of animals higher in the scale than frogs, such as rabbits, are pinched, they exhibit signs of pain, if we may judge from their look and from the noise they make, till the face and larynx are themselves affected, and it is therefore probable that sensory nerves convey impressions to the brain, even when the animnl is almost perfectly paralyzed in respect of voluntary movement.

The vaso-motor nerves also of some parts appear to be affected by conia; thus the arteries of the frog's foot fail to contract on irritation when the animal is poisoned by hemlock, but the motor nerves of some other involuntary muscles are uninfluenced by conia, as the peristaltic contraction of the intestines of rabbits killed by the alkaloid continued active after death.

When applied directly to the nerves, hemlock destroys their conductivity. The poison produces no pain.

Its influence on the brain will next be considered. No doubt both man and animals remain conscious of pain so long as they are capable of giving any signs of it; that is, before the muscles of expression become paralyzed. Still this is possible, while at the same time the brain may in some way be affected. Schroff states that a short time after the poison is taken it is followed by a feeling of heaviness in the head, with giddiness, inability to think, great impairment of common sensibility, blunted taste, dimmed sight, dilated pupils, and a sensation as of insects crawling on the skin.

The foregoing observations show that the mind is in some degree weakened, and that many of the special senses suffer. In Dr. Bennett's case there was total blindness, but the hearing was but little, if at all, dulled. Some observers assert that the mind remains quite uninfluenced by hemlock.

At an early part of this section it was stated that convulsions resulted from poisoning by this substance. These occur in some animals, not in others. Rabbits appear to suffer from convulsions, but frogs die unconvulsed. These spasms, Kölliker has suggested, may be due to asphyxia from paralysis of the muscles of respiration. This explanation, however, appears to be insufficient, as the convulsions often occur among the earliest symptoms, before any asphyxia has resulted; nay, if a tube is introduced into the trachea, and artificial respiration is performed, they still occur. In man convulsions are certainly sometimes absent, and in the case recorded by Bennett only slight movements in the left leg were witnessed.

In their recent investigations, Drs. Crum, Brown, and Fraser for the most part confirm the conclusions of Kölliker and Guttmann. They have shown, however, that specimens of conia are not of identical composition; for while each specimen produced the same symptoms, they find that these were not always produced in the same way. In other words, some specimens affect chiefly the motor nerves, while others act on both motor nerves and cord. Their observations on hydrochlorate of conia, methyl-conia, and iodide of dimethyl-conium, in a great measure explain these differences. They conclude that conia "produces paralysis solely by influencing the motor nerves," and that hydrochlorate of methyl-conia acts "on the motor nerves and spinal cord; with large doses the former action is completed before the latter, while with small doses the latter action is completed before the former." They conclude that commercial specimens of conia consist of mixtures in variable proportions of conia and methyl-conia; sometimes methyl-conia is present in small, at other times in large quantities. This variety of composition will explain the varied physiological effects of different specimens of conia.

Their observations on iodide of dimethyl-conium "show that the paralysis produced by dimethyl-conium is dependent on an action on the motor nerves primarily restricted to the peripheral terminations," and that the substance "is entirely free from spasmodic and paralyzing actions."

Concerning the action of this poison on the heart, very conflicting statements have been made. Thus some authorities state that it reduces the frequency of the pulse, especially when the heart beats too quickly from disease, as from fever, etc. Even a small dose under such conditions, they say, suffices to produce a very decided effect on the pulse, while in health the same quantity exerts no influence. Such are the conclusions of Wertheim.

Kölliker, Guttmann, and J. Harley conclude that conium does not affect the heart. Harley says, "Excepting as a transient emotional effect in nervous individuals upon the sudden accession of the symptoms after a first dose of hemlock, the heart and bloodvessels are absolutely unaffected by its operation. I have carefully determined this in persons of all ages—in the weakly infant not three months old, in the strong and debilitated, and in those who have intermittent action of the heart." He gave the medicine in sufficient quantities to produce partial paralysis.

In experiments with warm-blooded animals poisoned by hemlock, the heart, it is true, soon ceases to beat; but this can be for a long time retarded if artificial respiration is performed, and in the case of the frog the poison appears to leave the heart unaffected. Hemlock has been recommended in fevers and acute rheumatism, and in these diseases its efficacy has been supposed to be explained by its action on the heart. But, as we have just seen, it is very doubtful if conia exerts any influence on the heart.

Harley says conium, in doses sufficient to produce physiological effects, may be taken for months without affecting nutrition. It has been supposed to be useful in whooping and other kinds of coughs. It has been recommended lately by J. Harley in chorea, when the succus conii in one to four drachm doses, or even more, must be given; and in these large doses conium certainly controls temporarily the movement, and gives steadiness to the patient; but these effects wear off if the medicine is not soon repeated. It has yet to be shown that conium will shorten the course of this disease.

Hemlock was largely used by Dr. Neligan, in various painful affections, and in such cases we have his high authority in favour of its usefulness. He gave it in cancer, in rheumatism, and neuralgia. In no well-authenticated case has it yet been shown that conium produces either sleep, coma, or delirium.

Considering the physiological action of conia, it is evident that this drug is not indicated in convulsive diseases dependent on affections of the cord, as tetanus and strychnia poisoning; for the effects of this medicine and the symptoms of these diseases are not antagonistic. Guttmann, from whose valuable paper on the action of conia the chief part of our remarks has been extracted, put to the test of direct experiment the power of conia to arrest or check in any degree the tetanus from strychnia. He strychnized frogs, and then gave them conia; but, even when administered in doses sufficient to completely paralyze the animals, this drug failed to check in any degree the tetanic spasms produced by the strychnia.

It will be obvious how very similar the action of conia is to that of curare. One difference there is between these substances which has not been noted. Curare, when swallowed, is not poisonous, but is strongly toxic when injected under the skin. Conia in either way is equally poisonous.

Dr. Neligan draws particular attention to the fact that the only preparation of any value is the juice; and so true is this, that the various statements made concerning the success and failure of this remedy in various diseases must be accepted with caution, unless the conclusions have been deduced from observations founded on the use of this preparation.

CALABAR BEAN.

The following account is for the most part an abstract of Dr. Fraser's very valuable and elaborate investigations concerning the physiological action of the Calabar bean.

He finds that this poison destroys birds most easily, while frogs require as much as will kill a dog.

Little is known at present of the influence of the Calabar bean or its alkaloid on the structures of the stomach. Dr. Fraser has ascertained that gastric juice does not destroy the power of this drug; and, further, when solutions of it are injected into a vein, they may be detected in the contents of the stomach; whence it has been concluded that the active principle is eliminated by this organ. It is, however, possible for it to find its way here by mere imbibition.

The active principles of Calabar bean quickly enter the blood. After small but fatal doses the following symptoms occur:—

First, and very speedily, the animal manifests a slight tremulousness, which, beginning in the hind-quarters, spreads thence to the rest of the body. Soon the posterior limbs grow powerless, next the anterior extremities, and then the trunk, till muscular movement ceases, and the whole animal frame becomes limp and flaccid. There is general paralysis. The bowels and bladder are emptied involuntarily, and the pupils generally contract. At this stage all reflex action of the cord is destroyed; for if the animal is anywhere irritated, no contractions respond to the call. Under the influence of the poison, respiration grows gradually slower and slower, and at last ceases. So long as the animal retains the power of expression, evidence of consciousness appears to be preserved throughout. Immediately after death the pupils dilate. After death the muscles appear to be unaffected; for they contract as they are cut, and respond to irritation of their nerves. The heart, moreover, continues to beat the usual time after death, its parts ceasing to contract in their definite order. After a large fatal dose, the symptoms and *post-mortem* appearances are much the same as those just described, but of course death occurs sooner, and the symptoms follow each other in quicker succession. After a very large dose, death may be almost instantaneous. It appears to be owing to syncope; for when the body is open, the heart is found motionless, dilated, flaccid, and contracts but languidly on stimulation. The vermicular movements of the intestines are also more sluggish than after a smaller dose.

Whether Calabar bean produces its effects by influencing the muscles, nerves, cord, or the brain, are questions which will now be severally considered.

As muscular contraction could be easily and abundantly excited by direct irritation of the muscles, after the motor nerves had quite lost their power to conduct impressions, Dr. Fraser concludes that this poison exerts no influence on the voluntary muscles. Moreover the contractility continued a long time after death, and in frogs the rigor mortis was long postponed, while it certainly was not hastened in warm-blooded animals,—additional evidences of the absence of any paralyzing influence on the muscles by Calabar bean. The tremors in warm-blooded animals were generally slight, but were sometimes excessive, and might indeed be called convulsions. This phenomenon was probably due to the direct action of the poison on the muscles, like curare; for if the sciatic nerve was divided before poisoning the animal, the limb thus cut off from nervous connection with the nervous centres still trembled; while, on the other hand, if the sciatic nerve was uninjured, but the arteries leading to the limb were tied or divided, then, while the muscles of the body generally trembled, those of the ligatured limb remained at rest. This tremulousness often continues after death, and is excited by exposure and by the knife in cutting. It does not affect the whole muscle at the same time, but different parts in succession.

Observing that consciousness is intact when paralysis is marked and progressing, and that if a frog's brain is removed before the animal is poisoned, paralysis ensues as usual, Dr. Fraser concludes that the paralysis is not produced by any changes in the brain; but from the effects of the drug on himself he thinks the bean does exercise some influence on the faculties of the mind.

That paralysis is not produced by the action of the poison on the spinal nerves is evident; for long after the induction of general paralysis, and even after death, they conduct motor impressions to the muscles.

But though muscular paralysis and death are not to be accounted for by the action of the poison on the motor nerves, but in another way, as we shall shortly see, still after a time the poison does affect these nerves, and robs them of their power to conduct impressions to the muscles. As with conium, so probably with Calabar bean, the peripheral terminations of the nerves are first affected, and next their trunks. The afferent nerves remain unaffected, and certainly their power of conduction is not lessened; indeed, Fraser thinks it is increased.

The spinal cord, then, is the only part left on which the paralysis can depend, and Fraser has shown that the paralysis of the muscles is due to changes effected by the Calabar bean on the cord. Thus he found he could excite no muscular contractions by galvanizing any part of the cord of an animal poisoned by the bean, while the motor nerves still retained their functions, and easily transmitted impressions to the muscles, which on their part freely responded to very slight stimulation of their proper nerves.

The reflex functions of the cord were destroyed long before the nerves lost their conducting power. For after the loss of reflex power in animals poisoned by Calabar bean, pretty active muscular contractions could be excited by mild galvanic stimulation of the motor nerves, showing that the arrest in reflex action is not owing to lowered activity of the motor nerves. Again, if the lower half of the cord is protected from the poisoned blood by ligature or section of its vessels, while the blood is permitted to flow to all other parts of the body, and the animal is then poisoned, reflex action is speedily lost in the anterior, while it is retained for hours in the posterior limbs. As the nerves of every part of the body are equally subjected to the poison, the loss of reflex power cannot be due to alterations in them, otherwise the hind and front limbs would be equally paralyzed. The only part protected from the poison was the lower half of the cord, and it must be that Calabar bean destroys reflex power through the changes produced in the cord itself.

From its physiological action on the cord, Fraser recommends the ordeal bean as an antidote to strychnia, and he points out its superiority to curare, which paralyzes only the motor nerves, while the Calabar bean paralyzes first the cord, and then, after some time, the motor nerve.

Large doses of the bean instantaneously arrest the movements of the heart; smaller doses reduce their frequency.

Fraser contrasts Calabar bean with other cardiac poisons, such as antiaris toxicaria, tanghinia venenifera, digitalis, helleborus niger, helleborus viridis, and the green resin of nereum oleander, all of which, after a time, diminish the frequency of the heart's contractions by prolonging the systole, and finally stop the heart in the systolic act. Physostigma also diminishes the number of the heart's contractions, but it lessens the duration of each systole, and at last the heart ceases to beat in the diastole.

How does Calabar bean effect these changes in the functions of the heart? The paralysis of the heart in diastole, and the diminution in the frequency of its contractions by protracted periods of rest in a *dilated condition*, as well as the frequent renewal of its action after a long pause in diastole, might, in the first place, suggest the interference of the inhibitory function of the vagi nerves. Fraser, however, adduces conclusive experiments against this supposition. Thus he finds, after section of each vagi, or after paralyzing them with curare, which it effects in a few minutes in both the motor and vagi nerves, Calabar bean acted on the heart just as before. Again, when, previous to their being poisoned, the brain and cord of frogs were destroyed, the bean produced the same effects on the heart.

Physostigma is no doubt a respiratory poison, and in many instances destroys life by asphyxia; but Fraser has shown that it is likewise a cardiac poison. He poisoned a retriever dog, and while the respirations were actually increased by one in the minute, the pulsations of the heart were diminished by one half. This poison must therefore be considered to act on the heart directly, and not solely by its secondary effects on the respiration. Fraser concludes that the bean does not affect the heart through the vagi nerves, but through the cardiac ganglia.

Solutions of Calabar bean added to blood made the red corpuscles of rabbits and dogs irregular, but effected no changes in those of birds or frogs, nor in the white corpuscles of any animal Dr. Fraser examined.

The solutions appear to produce no change in the respiratory function of the blood.

The lymph hearts of frogs became paralyzed at an early stage of the experiments.

The intestines of animals poisoned by the bean moved at first with increased vigour, but at last contracted so as considerably to lessen the calibre of the gut, which afterwards became dilated again. The movements continued some time after death, except after a large dose of poison, when the movements were slight, and soon ceased.

In rabbits poisoned by this bean Fraser noticed energetic peristaltis in the cornua and body of the uterus, and in the ureters.

Calabar bean when swallowed, as is well known, causes the pupil to contract; but this effect is still more marked if a solution is dropped into the eye. Whether this contraction is produced through the sympathetic or otherwise is still an open question.

Dr. Robertson, who has paid great attention to the effect of Calabar bean on the eye, finds that even before the pupil begins to contract, the power of accommodation is lost, and that objects can be seen only at a limited distance of about a foot, all beyond appearing hazy and indistinct. The accommodating power, being affected before the pupil, is also the first to recover itself. Objects at all distances appear nearer and larger than they really are. The bean induced in the affected eye a sensation as of much straining and heaviness, like that occurring after a close inspection of fine objects.

About twenty minutes after the application of the solution, the pupil contracted to one half, and the field of vision was still further shortened. The contraction may increase for an hour or more, the sight of the other eye meanwhile remaining natural. The contraction ultimately slowly yields, but more than twenty-four hours may pass before the pupil resumes its natural size. The contraction may be extreme, when but little light finding its way through the narrowed pupil, the opposite pupil may dilate sympathetically.

Dr. Robertson has further shown that, in their action on the eye, belladonna and Calabar bean are directly antagonistic. The bean is freely used to produce contraction of the pupil.

Dr. Fraser has obtained some curious results from the topical application of solutions of Calabar bean to different structures of the body. He applied some solution of Calabar bean to the trunk of the sciatic, choosing this nerve on account of its comparative freedom from bloodvessels, and found to his astonishment that sensory conductivity was lost sooner than motor, and became at last completely destroyed. This loss of power to conduct sensory impression was not produced by mere imbibition of the fluid altering the physical state of the nerves, as other nerves kept moistened by water for a like time underwent no similar functional alteration. The completeness of this loss of power to conduct afferent impression was well shown by poisoning the animal by strychnia, after which no convulsive movement could be excited by irritating the structures below the poisoned sciatic nerve.

The irritability of the gastrocnemius was also destroyed by the local employment of strong solutions of the bean. This, too, was proved not to be due to mere imbibition.

When the solution was painted on parts of the intestines, these became relaxed, and the vermicular movements, on reaching these points, skipped over them, and continued in the portions beyond.

We now come to the therapeutical application of this remedy.

It was some time ago suggested that the Calabar bean might prove of much service in tetanus and chorea, and Dr. Fraser has lately written an interesting paper on this subject, from which we again largely borrow. Finding that the effects of strychnia on the frog can be arrested, he believes that the bean may be used with the greatest benefit in tetanus. Dr. Fraser very naturally insists on the importance of employing the drug at the very beginning of the attack, and enforces the value of this advice by the remark, that it has now been shown that when muscles contract they beget a substance which excites muscular contraction; and, further, that at the beginning of tetanus only a limited part of the cord or of the ganglia of the brain is involved, but, on the continuance of the attack, the whole of the structures become speedily affected. He disadvises the employment of the powder mainly on account of its tardy action. The extract should always be used either in the form of pill or in a solution in weak spirit of sp. gr. 0·920 (thirty-two grains to the fluid ounce). Dr. Fraser says that "Physostigma may be administered by the mouth, anus, or subcutaneously; and the special peculiarities of each case will be the best guide in determining which of these should be used. I should myself feel inclined always to commence the treatment by subcutaneous injection, to repeat such injection until the system is decidedly affected, and then to administer the remedy by the mouth, in a dose three times as large as is found necessary by subcutaneous injection.* Such a plan might be quite safely followed in a child of even nine years. If the remedial effects continue to be produced by administration by the mouth, it should be persevered with; for such administration has obvious advantages as far as the convenience of the practitioner is concerned. In the more severe cases, however, I believe subcutaneous injection should be alone employed. The distress and increase of spasm caused by swallowing, or the impossibility of introducing substances by the mouth, will render this necessary. I cannot, also, urge too strongly that subcutaneous injection should always be used when severe and continuous spasms occur, when a fatal result is imminent from the exhaustion caused by prolonged and frequent convulsions, and when apnœa threatens at once to close the tragic scene. By it we obtain the quickest and most powerful effects. Administration by the anus will be rarely necessary. It may, however, be employed to relieve the stomach, and will then be occasionally useful.

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* Dr. Eben Watson has not obtained good effects from hypodermic injection. He prefers to administer the drug by the mouth or rectum. He insists on the necessity of giving enough of the extract to produce relaxation of the spasms. He has given it to the extent of seventy-two grains in twenty-four hours.

"From the preceding remarks it cannot be expected that any arbitrary rules of dosage can be laid down. For an adult, one grain of the extract by stomach, or one-third of a grain by subcutaneous injection, will be generally sufficient to commence with. This should be repeated in two hours, when its effects will usually have passed off, and the succeeding doses may be modified according to the experience that will thus be gained. When used by subcutaneous injection, the dose of extract should be carefully mixed with ten or fifteen minims of water. This mixture has always an acid reaction, which is sometimes so decided as to produce slight irritation of the cellular tissue; but this can be avoided by carefully neutralizing the mixture with a solution of carbonate of soda. Suppositories, made with oil of theobroma and white wax may be employed when administration by the anus is desired. Each of these should contain two grains of extract. For children we must be guided by the general rule of employing, according to age, one-third or one-fourth, or even less, of the above doses. It will be found necessary to repeat these doses frequently—every hour, every hour and a half, or every two or three hours—and, of course, the severity of the disease and the effect of the remedy will be the best indications for this. The great object is to produce as quickly as possible, and then to maintain, the physiological effect of physostigma in diminishing reflex excitability. The doses must therefore be continued in increasing quantities until this physiological effect is produced, or until the sedative action of the drug on the circulation is carried to a dangerous extreme, or until constant nausea and vomiting compel us to desist.

"This nausea is, I believe, due to the action of physostigma in causing energetic contractions of the stomach and intestines. To this cause may also be referred a peculiar epigastric sensation, which is one of the first symptoms of the action of this drug, whether it be administered by the stomach or subcutaneously, and which is always relieved by eructation. The catharsis that physostigma causes—probably an advantageous effect in tetanus—is another result of this intestinal contraction, though it is also due to an increase of secretion by the intestinal glands.

"Another physiological effect of physostigma is excessive perspiration. This is most strikingly observed when a large dose is administered by subcutaneous injection. It may be of some importance in the treatment of tetanus, for sudorifics are vaunted as reliable remedies for this disease; but as I am at a loss to understand why perspiration should in itself prove beneficial, I mention it only as an indication that physostigma is affecting the system.

"It might reasonably be expected that the active principle of physostigma—eseria—should be valuable in tetanus, and especially for administration by subcutaneous injection. It is, however, an alkaloid that is very difficult to prepare, and, as far as my knowledge of its properties is concerned, it appears to be somewhat unstable. There is, besides, but little advantage in employing a more active remedy than the extract of physostigma.

"In these observations, no distinction has been drawn between the traumatic and idiopathic varieties of tetanus. As far as treatment is concerned, they only differ in this, that the traumatic variety is usually the more severe and acute, and that it therefore generally demands a very energetic and active employment of the remedy."

Dr. Fraser next makes a few remarks on the influence of this remedy over chorea, but at present there appears to be little evidence on this subject. "The treatment of this disease," he says, "will rarely require to be so active or energetic as that recommended for tetanus. Physostigma should be administered either in the form of powder or of tincture. From three to six grains of powder, three or four times daily, may be given to children, and from ten to twenty grains, as frequently, to adults."

THERAPEUTICS OF BELLADONNA.

As external applications, the preparations of belladonna are of frequent and great use; no applications are so effective for the relief of pleurodynia and the hyper-sensitiveness of the skin and irritability of the muscles of the chest in phthisis, as the liniment or plaster of belladonna. The liniment, both as the stronger and cleanlier preparation, is preferable to the plaster, and should be rubbed over the tender and painful part several times daily, according to the severity of the pain. Although as a rule the liniment is preferable, yet in certain cases of pleurodynia the constant application of the plaster gives more relief than the liniment. The liniment of belladonna, or the ointment of its alkaloid, is sometimes used in neuralgia of the face.

Myalgia, so admirably described by Dr. Inman, often yields to belladonna, although not uncommonly opium preparations, as the linementum saponis cum opio, succeed better.

It commonly happens that an attack of lumbago, affecting, perhaps the whole loins, leaves behind it one painful spot, which may distress the patient only when the body is moved in one direction. Remains of a lumbago like this generally resist the usual methods of treatment, and is, perhaps, driven from one spot only to reappear at another; but a large belladonna plaster will generally lessen, if not altogether remove them.

Belladonna externally applied checks or even suppresses the secretion of the glands. This at least is true of the mammary and sudoriparous glands, and possibly of other glands. It is well known that belladonna rubbed into the breast will arrest the secretion of milk. It may be employed with great advantage when from any cause a mother with abundance of milk is yet unable to suckle her child, and the breasts in consequence become much swollen, exquisitely painful, and threaten to inflame and suppurate, unless the tension of the ducts is relieved by the removal or suppression of the milk. In such a case, if the milk cannot be artificially drawn off, the secretion must be suppressed, which can be easily effected by belladonna. It should be applied early, before inflammation has set in, and then in a few hours the swollen painful breast gradually diminishes, and soon becomes soft, comfortable, and painless. But should this early stage have passed by, and inflammation has set in, and the breasts become tense, shiny, hard, knotty, red, and exquisitely painful, the continuous application of belladonna for twenty-four or forty-eight hours will, even under these adverse circumstances, often remove the tension and inflammation, and arrest impending abscess. The rapid manner it affords relief in these cases will greatly astonish any one unaccustomed to its use; in fact, it is impossible to overstate the usefulness of belladonna. It should be employed in all cases, no matter how far the inflammation has advanced. In many instances it will arrest an abscess otherwise almost certain to occur. Even when it fails to prevent suppuration, yet the application of belladonna will reduce inflammation, subdue much of the pain, and greatly limit the inevitable abscess.

The liniment, the extract, the ointment, or a drachm of the tincture to an ounce of olive oil, or two drachms of the liniment mixed with an ounce of lard, may be used. The liniment is speedily effectual. These applications should be rubbed especially over the areola around the nipple.

Frequent fomentation with very hot water, unless cooler water should be found more agreeable and soothing, is an excellent adjunct to these applications. The nurse must be cautioned to wipe the skin perfectly dry after fomenting, or the friction with the liniment will irritate the skin, and produce a sore.

Belladonna will not only arrest the secretion of milk, but will also arrest the secretion of the perspiration. These are the grounds for this assertion:—A man forty-five years old had been troubled for many months with very profuse sweating of the right side of the face and neck, breaking out on the slightest exertion, or if near a fire, or when excited, so that the sweat ran down his face and neck in streams, soaking his collar and the band of his shirt. The perspiration produced an abundant crop of miliary vesicles, which were strictly limited to one half his face. At such times his face was neither red nor injected. The liniment of belladonna applied two or three times a day considerably abated this abundant sweating, and reduced it to little more than natural.

The effect of belladonna in this instance led the writer to test its powers over other kinds of sweating. The sweating about the head and face of young children, often so profuse as to soak their hair and the pillow on which they have been sleeping, can be completely checked by the liniment of belladonna, used twice or three times a day. After a few days the application may be discontinued without a return of the perspiration. Again, many adults, even when in health, during all their lives, are troubled with profuse sweating of the hands or feet; sometimes so profuse as to run off them in drops, and especially noticeable at the tips of the fingers and the ball of the thumb. By rubbing the belladonna liniment into the hands or feet three or four times a day, this annoying affection may be much lessened, and sometimes completely removed. The writer cannot at present say whether these complaints can be permanently cured, so that the liniment may be discontinued.

It is probable that the secretion of that abundant foul-smelling sweat from the feet may be prevented by the belladonna applications. In making the liniment, eau de Cologne may be used instead of simple spirit, thus forming an agreeable-smelling liniment. That in the cases just described the effects are due to the belladonna, and not to the spirit, has been experimentally proved.

When used to check sweating about the head and face, too much liniment should not be applied at a time, or, becoming absorbed, it dilates the pupil, and obscures the sight.

Remembering that in acne there is over-abundant secretion from the sebaceous follicle, the writer was induced to use belladonna with the hope of checking it, and so controlling the disease. This treatment has appeared to be of some slight service, although its effects are much less apparent than on the sweating above described.

While speaking of milk abscesses, it was stated that, apart from its power to arrest the secretion of milk, belladonna will in some measure subdue inflammation and its accompanying pain. Other inflammations, threatening perhaps to end in abscess, may be effectually treated with belladonna. Mr. Christopher Heath has shown that the formation of abscesses in the neck and elsewhere may be prevented; and after the onset of suppuration the pain and inflammation may be checked. The belladonna treatment of boils and carbuncles often succeeds.

Belladonna preparations are of still further use as local applications. Thus the extract smeared over the painful cracks in the mucous membrane is employed to relieve the pain of fissures of the anus.

The extract, in conjunction with tannin, in the proportion of one or two grains of extract to six or eight of tannin, is recommended by Trousseau, in leucorrhœa with ulceration of the os uteri, and in neuralgia of the uterus. The belladonna arrests the too abundant secretion from the mucous glands on which leucorrhœa depends, while its action in this respect is assisted by the tannin. In both diseases the belladonna is very efficient in relieving pain. The mixture of belladonna and tannin may be wrapped in cotton-wool, or made into a bolus with cocoa-nut fat, and placed in contact with the painful and over-secreting os. Some obstinate forms of leucorrhœa yield completely to such treatment.

When the disease depends on too free a secretion of the mucous glands about the os uteri, and when this condition is accompanied by much pain, the following injection yields good results: Bicarbonate of soda, a drachm; Tr. of belladonna, two ounces; water, a pint. One or two syringefuls of this should be injected into the vagina, and made to reach the mouth of the uterus. The syringe should be introduced as far as possible, while the patient lies on her back, with her buttocks raised by a pillow. The injection should be used cold, and some of it allowed to remain in the vagina for a few minutes.

Dr. Anstie has recently recommended atropia in hypodermic injection, to relieve local pain and spasm. He vouches for its great efficacy—"It should be employed in the form of solution of the sulphate, four minims containing 1-60th part of a grain, two minims will be the proper commencing dose in adults, unless the pain to be relieved be very severe. It should be cautiously increased to 1-60th or 1-50th part of a grain, more can seldom be needed." He further states, "It is somewhat less frequently tolerated than morphia, but persons quite unable to bear morphia will often bear atropine, and *vice versâ*." Dr. Anstie has employed atropine hypodermically, with great benefit in one case of asthma, and in two of glaucoma. The same treatment is sometimes useful in neuralgia and sciatica, although the pain of these affections is generally more easily subdued by morphia.

Dropped into the eye, applied to the skin in its neighbourhood, or taken by the stomach, preparations of belladonna very speedily produce extreme dilatation of the pupil. This is one of the most characteristic effects of belladonna. In iritis and some other eye diseases, solutions of atropia are used to produce dilatation of the pupil, and to prepare the eye for an opthalmoscopic examination. Belladonna is employed both locally and internally in conjunctivitis and other inflammations of the eye.

Neuralgia, especially of the fifth nerve, as of the brow or under the eye, severe pains in the eye-ball, with intolerance of light, and even sciatica, are sometimes relieved, or even removed, by the local application of the liniment or ointment of belladonna. In obstinate forms of the foregoing diseases belladonna may act better after the skin has been removed by a blister, or a sore made by an issue.

A full dose of belladonna, in any of its forms, produces great dryness of the tongue and roof of the mouth, extending down the pharynx and larynx, inducing consequently some difficulty in swallowing, with hoarseness, and even dry cough. Dryness of the Schneiderian membrane, and dryness of the conjunctiva, with much injection, may also result from a large dose of this drug.

"After about two hours," says Dr. J. Harley, "the dryness of the mouth gives way, to be replaced by a viscid, sticky, acid, and foul-smelling secretion, and the mucous membrane becomes clammy, and the tongue is covered with a white fur." Harley produced ophthalmia in a dog by belladonna. Many of these symptoms indicate the influence of belladonna in arresting secretion.

In several instances Harley has seen belladonna clean and moisten the tongue of typhus-fever patients. This remedy is employed in several inflammatory diseases of the throat. Its good effects are most apparent when the throat and tonsils are acutely inflamed and much swollen. It may be given in combination with aconite. The influence of aconite on this form of inflamed throat, provided the pulse is full, and the skin hot and dry, is greater than that of belladonna.

The influence of belladonna on digestion is not known.

The tincture may afford relief in some painful affections of the stomach—a very vague statement, but as exact as our present knowledge will permit. The author has heard it praised in "gout of the stomach." In doses of twenty or thirty minims, administered every three or four hours, the tincture has arrested obstinate forms of the vomiting of pregnancy.

In what way this medicine affects the intestines is not ascertained; but, remembering its influence on the lining membrane of the mouth, it may be conjectured that belladonna lessens the secretion of the intestinal canal. It has been asserted, but without adequate proof, that belladonna increases the peristaltic movement of this canal.

Trousseau recommended belladonna in obstinate constipation, and there is no doubt that in many instances it succeeds admirably. He advised doses of 1-6th to 1-4th of a grain of the extract to be taken once a day, either night or morning, increasing gradually the dose; and when the constipation is removed, the medicine should be diminished or discontinued. Dr. Nunneley finds this treatment useful in all forms of constipation, especially co-existing with dyspepsia, characterized by a thinly furred tongue, with prominent red papillæ at the tip, epigastric tenderness, pain after food, and often more or less headache. Dr. Nunneley says belladonna ensures a natural evacuation daily, and sometimes cures the constipation. The medicine must be continued a fortnight or three weeks. Belladonna often relieves colic of the intestines; it is especially serviceable in the colic of children.

That the active principle of this medicine is readily absorbed into the blood, is proved by the symptoms arising after its administration. After a considerable dose of belladonna the face becomes much flushed, the eye bright, dry, and injected, the pupil dilated, the sight dim and hazy, while the power of accommodation in the eye for distance is lost. The mind and senses are peculiarly affected. There is much mental excitement; the ideas, at first rapid and connected, become incoherent and extravagant; there is often decided delirium, with pleasing illusions. Sometimes the patient is possessed with constant restlessness, keeps continually moving, and cannot be quieted. A kind of somnambulism is occasionally observed; thus cases are recorded where, under the influence of belladonna, the patient has for hours performed the movements customary to his occupation. It is narrated of a tailor that he sat for hours moving his hands and arms as if sewing, and his lips as if talking, but without uttering a word.

The delirium may be furious and dangerous, requiring the patient to be restrained; nay, it is recorded of one poisoned by this drug, that so violent did he become that he was ordered to be confined in a mad-house. Sometimes a very small quantity of the plant will induce this mental disturbance; so great indeed is the susceptibility of some persons, that even when applied to the skin in the form of plaster or ointment, it affects them in a marked manner.

Belladonna weakens the muscular power, and renders the gait unsteady and staggering. A patient may lose control over his movements, and, unable to direct his course, may run against objects he sees, yet desires to avoid.

Most observers state that it produces severe pain in the head, generally situated over the forehead and in the eyes; but sometimes these pains affect the top of the head. Singing in the ears, too, occurs, with more or less giddiness. In persons poisoned by this plant, spasmodic contraction of the sphincter of the bladder has been observed not unfrequently, and a scarlet rash has broken out on the skin—a rash said to be like that of scarlet fever, and to be most marked in the neighbourhood of the joints.

The first effect of belladonna on the pulse is to increase its quickness, fulness, and force to the extent even of fifty to sixty beats in the minute. This condition of the circulation, continues till the tongue and mouth become moist and clammy, when the pulse diminishes in frequency, and loses in strength (J. Harley). In fatal cases the pulse grows rapid, intermittent, and weak. Dr. J. Harley considers belladonna a powerful heart tonic, producing in proof the power of this drug to reduce the frequency and to strengthen the beats of the heart when weakened by disease.

Dr. Nunneley asserts that in the frog belladonna neither increases the frequency of the heart's beats, nor dilates the pupil. If these statements are correct, belladonna must affect the frog otherwise than man and some other animals, as the dog, the horse, etc.

It is stated by Wharton Jones, Meuriot, J. Harley, and others, but denied by Nunneley, that belladonna, when applied to the web of the frog's foot, contracts the smaller arteries, producing at first acceleration of the circulation, followed after a time by complete stasis, beginning, according to Meuriot, in the veins and capillaries; "and the circulation always continues in the artery for some time after it has completely ceased in the vein." Harley says that contraction of all the arteries follows the administration of a moderate, but dilatation after a large, dose of belladonna. The contraction he conceives is due to stimulation, and dilatation to exhaustion of the sympathetic system, resulting from its previous over-stimulation.

Meuriot is of opinion that belladonna paralyzes the peripheral branches of the vagus nerve, and by this means accelerates the heart's action. Against this conclusion J. Harley advances several ingenious arguments, and considers the acceleration of the heart's action to be due to stimulation of the sympathetic. The action of belladonna on the pupil has been variously explained, some averring that it depends on paralysis of the third nerve supplying the iris; some teaching that it is due to excitation of the sympathetic; and others maintaining that this drug, by preventing turgescence of the vessels of the iris, produces the dilatation.

Brown-Séquard considers the sympathetic nerves of the neck are divided into two sets, one for the pupil, one for the bloodvessels of the face and neck. It has been asserted that the congestion of the face and conjunctiva occurring after belladonna is owing to paralysis of that set supplying the vessels of those parts; but as the pupil is at the same time dilated, belladonna is considered to act as a stimulant to that part of the sympathetic system supplying the iris. It will be gathered from the preceding remarks, that J. Harley considers belladonna a stimulant of the whole sympathetic system; but that if its action is carried to excess, this system becomes exhausted, when dilatation of the vessels ensues, and the face and conjunctiva become congested.

Brown-Séquard maintains that both belladonna and ergot of rye exert a powerful influence on the unstriped muscular fibres of the body, instancing the power of each to dilate the pupil and to produce contraction of the uterus. He has seen the vessels of the pia mater of dogs contract after large doses of belladonna or ergot of rye, and he further states that both possess the property of lessening congestion of the cord; for, after full doses of either medicine, the reflex irritability of this part diminishes. Moreover, he adds that one acts especially on the involuntary muscles of one part, and the other chiefly on those of another part.

Thus he concludes that belladonna affects especially the pupil, bloodvessels of the breast (and so arrests the secretion of milk), muscular fibres of bowels, sphincter of bladder (and so removes nocturnal incontinence of urine) [?], while ergot acts especially on the muscular structure of the womb and bloodvessels of the cord.

Thus many of the phenomena ascribed by Harley to stimulation of the sympathetic are attributed by Brown-Séquard to the effect of belladonna on unstriped muscular tissue. These speculations have led Brown-Séquard to use belladonna and ergot in those forms of paralysis depending on chronic inflammation of the cord. By giving ergot internally, and by applying belladonna along the spine in the form of plaster or ointment, he seeks to contract the vessels and to lessen the supply of blood to the cord.

Belladonna is not unfrequently used to relieve pain. Dr. Anstie considers it the best remedy to migitate every kind of pain in the pelvic viscera. Some neuralgias, no doubt, yield to this medicine; it appears to possess most efficacy over neuralgia referable to the fifth nerve. Cases are recorded of relief afforded by it in sciatica.

Trousseau recommended the following method of treating neuralgia:—To administer one-fifth part of a grain every hour till giddiness is produced, and then to lessen the quantity; but continuing the medicine for several days.

The same authority employed belladonna successfully in epilepsy, according to the following method:—"During the first month of treatment, the patient takes a pill, composed of extract of belladonna and powdered leaves of belladonna, of each one-fifth part of a grain, every day, if his attacks occur chiefly in the daytime; or in the evening, if they are chiefly nocturnal. One pill is added to the dose every month; and whatever be the dose, it is always taken at the same period of the day. By this means the patient may reach the dose of from five to twenty pills, and even more." The dose is to be regulated by the circumstances of the patient. Such treatment, it is said, even when it fails to cure, yields much relief.

Belladonna succeeds often in allaying both the cough and oppressed breathing of asthma. To ensure success, however, it must be employed in considerable doses, as Dr. H. Salter has lately pointed out, and the author has often verified his observations. It may be necessary to give ten minims of the tincture every two or three hours, a quantity generally well borne; but if any of the undesired symptoms of belladonna set in, the dose must be reduced. A dose like this need only be taken at the time of the paroxysm; but when this lasts several days, the medicine should be given in the quantity recommended till an impression is made on the disease. The effect is most often satisfactory, either averting the attack or rendering it milder.

Belladonna is one of the best remedies for whooping-cough; but, to obtain any good from it, it must be employed in very considerable quantities, as in asthma. Thus to children two and three years old the author often gives as much as ten minims of the tincture every hour, and this quantity usually produces no effect, except on the disease, neither dilating the pupil, nor, so far as one can judge in children so young, making the throat dry; and it certainly does not in children a little older, who are able to express their feelings.

If drowsiness, delirium, or dilatation of the pupil occur, of course the dose must be diminished. The only symptom the author has witnessed from these large doses is dilatation of the pupil. Children, it is well known, bear belladonna much better than adults; and this fact accounts for the slight effect of so large a dose, and for the small influence which a less quantity exerts on whooping-cough—a disease of childhood. Under these doses the severity and frequency of the cough is often much reduced, even during the period when it is most violent and convulsive. But, like all other remedies in this disease, belladonna is of little use if the child is exposed to cold and cutting winds. If the weather is cold, it is necessary to keep the child confined to the house in a warm room. If the weather is mild, outdoor exercise is, of course, highly beneficial; but cold must be most carefully avoided.

While there can be no reasonable doubt of the great usefulness of belladonna in many cases of whooping-cough, it must be admitted that in many instances, without apparent reason, it seems of no avail. Influences at present not understood appear to modify its effect; for in some epidemics it is very successful, while in others it appears to be inoperative. Belladonna exerts but little effect on whooping-cough, when bronchitis or any irritation exists, as that from teething, worms, etc. If the gums are red, swollen, and painful, they must be freely lanced, and the other sources of irritation removed. Belladonna is considered of especial use at the third week of the attack,—at a time, that is, when the febrile stage has passed away, and the violence of the convulsive attacks is declining.

Belladonna is often useful in other coughs, although with our present knowledge on this subject it is impossible to lay down precise rules for its employment.

It is often useful in certain forms of headache. The indications for its use are when the pain is situated over the brows and in the eyeballs, which seem as if too large for the head, and as if they would be forced out of the skull. These headaches are not due to stomach or uterine derangements; indeed, very often their cause cannot be discovered. Not unfrequently they seem due to weakness and overwork, being especially met with in young women. Three minims of the tincture should be given every three hours.

It is said that the delirium of fevers, as of typhus fever, can be controlled by belladonna.

Belladonna is both speedier and more certain than any other remedy in removing that troublesome affection, incontinence of urine of children. It must be given in doses of ten to twenty drops of the tincture three times a day. Small quantities often fail, where large ones succeed at once. Sometimes the incontinence is not limited to the night, but may trouble children even in the day. These severe forms will often yield to belladonna. But while in fitting cases it is thus effectual, still it often altogether fails, although no worms infest the intestines, no irritation exists about the rectum, nor other reason seems to exist to account for its failure. Strychnia, cantharides, turpentine, santonine, or galvanism should then be tried.

Belladonna, used internally or externally, is certainly efficacious in erysipelatous inflammation. It may be given in combination with aconite; but when the skin is hot and pungent, and the pulse firm and resistant, aconite exerts over this inflammation an influence far more potent than that of belladonna.

Belladonna has been recommended as a preventive of scarlet fever. So much prejudice has been introduced into this question, that it is difficult to ascertain whether it is useful in this respect.

Belladonna has been found of service in the treatment of seminal emissions.

As belladonna and opium are in some respects reciprocally opposed in their action, as on the eye, etc., it has been assumed that they must be opposed in every particular, and that one may be used as an antidote to the other. Believing in this antagonism, many cases are adduced of opium poisoning where the symptoms, although very serious, were apparently removed by belladonna, and *vice versâ*. Dr. Erlenmeyer concludes from his observations, that, in respect to their action on the brain, these agents are antagonistic, and that no coma will result when they are administered conjointly, but that they do not counteract each other's influence on the sensory nerves, and hence he recommends them to be given in combination to relieve pain. On the other hand, some authorities, among whom may be named Brown-Séquard and J. Harley, dispute this antagonism, on the ground that the cited cases are insufficient to prove it; and it has not been observed in experiments made on man and the lower animals. The reported cases in favour of this antagonism have been severally criticised by Harley, who points out that many were treated by other remedies besides belladonna; in others a fatal dose is not proved to have been taken; and the patients who recovered after the administration of belladonna did not improve sooner than had no belladonna been administered. Harley's conclusions, which are in most respects directly opposed to those of Erlenmeyer, are—"1. That in medicinal doses the essential effect of morphia (hypnosis) is both increased and prolonged by the action of atropia, whether induced previously or at any time during the operation of the former. 2. That atropia relieves and, if given simultaneously or previously, prevents the nausea, vomiting, syncope, and insomnia which frequently result from the action of opium. 3. That in a sufficient proportion (for most individuals one forty-eighth part of a grain of sulph. atropia to a quarter of a grain of acetate of morphia) atropia neutralizes the contractile effect of opium on the pupils, but in larger doses dilatation takes place, as if no morphia had been given. It is also to be observed that if the quantivalent doses are *successively* introduced, the drug last administered exhibits for a short time a counteracting effect. 4. That all the other effects of atropia are intensified and prolonged by the action of morphia, induced previously or at any time during the operation of the former. If, however, the dose of atropia be small, and the morphia produce considerable deranging effects on the vagus, the rapidity of the pulse is not greater than when the atropia is administered alone."

Had Harley given opium in a dose just sufficient to destroy life; then if, after the employment of belladonna, death had ensued, it would have been proved that belladonna would not arrest the fatal effect of opium, and *vice versâ*. In no reported instance did he use enough of either substance to destroy life, hence his observations are not so convincing as they might have been; but as the coma from opium was intensified by belladonna, his observations are valuable.

Amid all this diversity of opinion, it must be admitted that, on the subject of this antagonism, more proof is needed. But while there is room for doubt concerning the antagonism between opium and belladonna, the interesting experiments of Fraser have demonstrated beyond question that atropia is an antidote to physostigma. He experimented on dogs and rabbits; but, as the action of these substances on man and animals is identical, he concludes that atropia will neutralize the fatal effects of physostigma on human beings. His experiments were conducted in three ways: 1. He administered the atropia before the physostigma; 2. He administered them together; 3. He administered the physostigma, and after the animal was completely paralyzed he injected atropia. In each series of experiments atropia prevented the fatal effects of physostigma, although physostigma was employed in fatal quantities, as was afterwards proved by administering to the animal the same or a smaller dose by itself, when in every instance the animal speedily died. Fraser concludes that "the lethal effects of doses of physostigma greatly in excess of the minimum fatal, may be prevented by doses of atropia greatly below the minimum fatal." He recommends, "in treating cases of poisoning in man, the sulphate of atropia should be given by subcutaneous injection, in doses of from one-fiftieth to one-thirtieth part of a grain. The exhibition of the antidote should be persevered with, in repeated doses, until the pupils are fully dilated and the pulse rate increased, and probably also until the hypersecretion of bronchial mucus, which greatly impedes respiration, is completely checked."

He thus summarises the antagonism between these two substances: "That physostigma increases the excitability of the vagi nerves, while atropia diminishes and suspends this excitability; that physostigma diminishes the arterial blood-pressure, while atropia increases it; that physostigma greatly augments the secretion of the salivary, bronchial, intestinal, and lachrymal glands, while atropia diminishes and even completely checks these secretions; and that physostigma contracts the pupils, while atropia, to a much greater relative extent, dilates them. Besides these effects of the action through the blood, various opposed topical effects have been observed, among which is the contraction of the veins by physostigma—the existence of which rests on the high authority of Mr. Wharton Jones—and the contraction of the arteries by atropia."

Preyer maintains that atropia, by paralyzing the peripheral branches of the vagus nerve, will prevent the arrest of the heart's contractions by hydrocyanic acid; and is thus an antidote to prussic acid.

That atropine is separated from the body in part by the urine may be proved by dilating the pupil by introducing into the eye some of this secretion voided by one to whom belladonna has been given. J. Harley states that within two hours atropine is separated from the body, as none is to be found in the urine after that time.

Dr. Garrod has shown that caustic fixed alkalies destroy the active principle of belladonna, hyoscyamus, and stramonium, but that carbonate and bicarbonates of potash and soda do not destroy it. Lime-water possesses this power; hence it has been recommended as an antidote in poisoning by belladonna. (J. Harley.)

STRAMONIUM.

This remedy produces symptoms very similar to those of belladonna. A stramonium ointment, made by mixing half a pound of fresh stramonium leaves with two pounds of lard, and heating gently till the leaves become friable, then straining through lint, is used at the Middlesex Hospital to relieve pain. The ointment, spread on lint, is applied thrice daily. Stramonium is mainly used in asthma, smoked with or without tobacco, to reduce spasm. It is especially useful in pure asthma, that is, when the lungs are structurally free from disease, and is useless when the dyspnœa is owing to heart disease. Twenty grains of the dried leaves, or ten of the powdered dried root, may be smoked, inhaling meanwhile into the lungs; or the fumes puffed into an inverted tumbler until it is filled may be placed over the mouth, and the contents inhaled by a deep inspiration. It excites a good deal of cough, but soon produces copious secretion when the fit subsides. The inhalation may be repeated again and again. It is preferable to smoke the plant unmixed, as few persons can draw the fumes of tobacco into the lungs without great discomfort. There is no doubt that stramonium is very successful in many cases of asthma; but in others, without apparent reason, it fails; and even when it succeeds, its influence, gradually diminishes by use. Sometimes datura tatula succeeds where datura stramonium has failed. It has been used in neuralgia.

Like belladonna and hyoscyamus, its active principle, as Dr. Garrod has shown, is destroyed by caustic potash and caustic soda.

HYOSCYAMUS.

In many respects the effects of this drug correspond to those of belladonna and stramonium. Thus it produces dryness of the mouth and throat, dilatation of the pupil, presbyopia, lightness and swimming in the head, delirium and hallucinations, a drunken gait, and often a strong desire to fight. Sometimes there is aphonia, and often sleepiness, with oppressive, disagreeable dreams. A red rash has been observed after large doses. The pulse at first is much lessened in frequency, but soon recovers itself, sometimes becoming even quicker than before the medicine was taken.

Hyoscyamus is generally used to produce sleep when opium disagrees, but it is doubtful whether it is a direct soporific. It perhaps induces sleep indirectly by removing pain—even if it does this. It has also been employed in neuralgia.

Like atropia, its active principle is destroyed by the fixed caustic alkalies, as Dr. Garrod proved.

HYDROCYANIC ACID.
CYANIDE OF POTASSIUM.

These poisonous substances are destructive alike of animal and vegetable life.

When applied to the skin for a long time, solutions of these substances excite some inflammation, particularly the cyanide, on account of its alkalinity.

Kept in contact with the skin for any length of time, they diminish sensibility; formerly they were employed externally in painful diseases, such as neuralgia and rheumatism; now, however, they are quite superseded by more successful remedies. But in allaying the tormenting itching of urticaria, lichen, eczema, and prurigo, they are undoubtedly very serviceable. The itching skin should be bathed with a lotion made of a drachm of the cyanide of potassium to a pint of water, or thirty drops of hydrocyanic acid to the ounce of water or glycerine. In respect to the cyanide, the action of the prussic acid is assisted by the potash in combination with it. It need hardly be observed that such a lotion must not be applied to the broken skin, for fear of poisoning by absorption.

The acid possesses a bitter characteristic taste, and excites a sensation of itching in the mouth. It stimulates the flow of saliva, possibly by its action on the mucous membrane of the mouth.

Taken in moderate doses, the acid in a healthy stomach appears neither to produce nor to undergo change; it is nevertheless much used, frequently with benefit, in painful diseases of this organ, as in chronic ulcer, cancer, chronic gastritis, gastralgia, etc. Not only does it occasionally mitigate the pain of these affections, but it may also check vomiting.

Hydrocyanic acid passes very speedily into the blood, and is as speedily eliminated, probably with the breath; hence, if life can be supported for half an hour after a poisonous dose, the patient is generally safe.

How it destroys life is still a disputed question. Being equally fatal to plants and animals, it is not necessary that it should act on the nervous centres, as, from the rapidity of its action, has been supposed. From his experiments on frogs, Kölliker concludes that it paralyzes first the brain, next the cord, and then the motor nerves, the paralysis extending from the trunk to the periphery. It paralyzes the heart, this organ ceasing in the diastole. The voluntary muscles soon lose their irritability, and become stiff.

Preyer maintains that large doses of hydrocyanic acid paralyze the heart at once; that moderately fatal doses deprive the blood of oxygen; and that as belladonna paralyzes the peripheral branches of the vagus, and at the same time stimulates the nervous centres of respiration, atropia, hypodermically injected, in these cases will prevent death.

OPIUM AND ITS PREPARATIONS.

PREPARATIONS of opium, applied by means of poultices or friction, are absorbed by the unbroken skin.

Poultices containing laudanum are used to allay the pain of superficial and even of deep-seated inflammations; in this way enough may be absorbed to produce deep sleep. Friction increases the absorption considerably; thus liniment of opium, well rubbed in, relieves neuralgias, pleurodynia, and myalgia. The abraded skin absorbs still more freely, and preparations of opium or morphia are applied to irritable, cancerous, and simple sores. Morphia dissolved in glycerine, and spread on lint, is a useful application to a painful cancerous sore.

The hypodermic injection of morphia introduced by Dr. Alexander Wood, is now extensively employed to relieve pain, produce sleep, prevent spasm, and for other purposes. This method is superior to the administration by the mouth in the following particulars: (1) Its action is more rapid; (2) its effects are more permanent; and (3) it neither destroys the appetite nor constipates the bowels. Dr. Anstie maintains "that anodynes and hypodics ought never to be administered by the mouth in acute diseases attended by anorexia." The injection may be made in any part of the body; but, for the sake of convenience, it is better to choose a place where the skin is loose. At first not more than a twelth to a sixth part of a grain should be injected; a larger quantity sometimes produces serious symptoms, and an injection not unfrequently causes a good deal of excitement, giddiness, even intoxication, great nausea, and repeated vomiting, followed by considerable depression (*vide* Belladonna.) Often, indeed, the patient is unfitted for work during the rest of the day. Under long trial of the injections, the system becomes habituated to opium, and not only must the quantity be increased, but on discontinuing its administration a patient suffers the depressing effects of an opium-eater deprived of his opium. These sufferings are sometimes so severe that patients declare that the distress occasioned by the discontinuance of the injection is worse than the pain itself. In making the puncture, the point of the needle should be pushed through skin into the connective tissue, carefully avoiding the veins. If patients dread the slight pain of the puncture by the injecting needle, the sensibility of the skin may be first deadened by the ether spray. Immediately after the injection, a sharp, smarting pain is felt, and, in many cases, a large flat weal, like that of urticaria, soon arises. It should be remembered that these injections sometimes leave a hard horny cicatrix, on which account it is important to inject some part of the skin covered by the clothes.

A single injection sometimes cures recent and even long-standing sciatica and facial neuralgia, but usually it gives only temporary relief, and the injection must be repeated from time to time. A single injection frequently cures lumbago at once; but as the mere insertion of a needle is often equally efficacious, some of the speedy cures must be attributed to the effect of unintended accupuncture. Hypodermic injections relieve the pain of severe pleurodynia, but most cases of pleurodynia yield to milder treatment. They are particularly efficacious in the pain of renal, biliary, and intestinal colic. Although not often required, a mild morphia injection will relieve severe toothache. Morphia injections are sometimes needed to relieve the pain of acute inflammations, like pleurisy and pneumonia, but are rarely required unless the suffering is severe or persistent. Morphia injections are used to produce sleep. When subcutaneously injected, morphia acts more speedily and in smaller quantities than when swallowed. It is injected to produce sleep in acute mania, delirium tremens, chorea, etc. In delirium tremens, even when bromide of potassium and chloral have failed, an injection often speedily produces sleep. A morphia injection is useful in chorea, when the movements prevent sleep, and when sleeplessness, by weakening the patient, increases the movements. Dr. Clifford Allbut employs morphia injections in dyspepsia of an irritable kind, giving them when the patient is spare, fretful, keen, hasty or absent in manner, with a tongue too clean, red at tip and edges, small pulse, and broken sleep.

Dr. Allbut strongly recommends a morphia injection in the dyspnœa of heart disease, and in disease of the large vessels; in the pain of angina pectoris, and of intra-thoracic tumours. By removing dyspnœa, it permits sleep, and recruits the worn-out patient. It strengthens the heart, and so removes congestion of the lungs and face. Dr. Allbut considers it less useful in aortic than in mitral disease. The author has long employed these injections in heart disease, and can corroborate Dr. Allbut's statements.

Dr. Spender employs morphia injections to arrest the severe vomiting of pregnancy and other obstinate and dangerous forms of vomiting. An injection often arrests persistent hiccup, and sometimes puerperal convulsions; it has likewise been successfully employed in tedious labour, produced by a rigid os utero.

Mr. Buxton Shillitoe strongly recommends the local application of an extract of opium, the consistence of treacle, to carbuncles and boils. The extract must be thickly smeared three or four times a day over and around the swelling. Applied early, it often causes the boil to abort; or it limits its progress, and eases pain. After employing the extract, Mr. Shillitoe applies a plaster, composed of equal parts of soap, opium, and mercury, spread on thick leather. Should suppuration occur, he lets out the matter, and applies a poultice over a small hole cut in the plaster.

Dropped into the eye, laudanum and solutions of morphia cause smarting, redness, and slight inflammation of the conjunctiva. They contract the pupil, but less so than if administered in other ways. Opium, however, is never used specifically to contract the pupil, Calabar bean effecting this more safely, easily, and thoroughly.

Opium wine, dropped into the eye, is used to relieve the pain of conjunctivitis, and by slight stimulation to improve the condition of the membrane. The wine of the present Pharmacopœia, containing spices, must not be so employed, as it would aggravate the mischief; but the wine of the Pharmacopœia of 1864 must be used. Mixed with either tannin or creasote, opium is often introduced into the hollow of a painful tooth; and if the pain is produced by inflammation of the exposed pulp, this application often gives relief.

The absorption of a somewhat full dose of opium produces much disagreeable dryness of the mouth and throat. The same annoying symptom follows likewise on the hypodermic injection of morphia.

The preparations of opium are rarely used for their topical effect on the throat, but the author thinks that their good effects are due to their topical action on this part. For instance, many coughs are really owing to the condition of the throat, as in some cases of phthisis, where this part is red, inflamed, and even ulcerated,—a condition which excites much irritation, and a frequent hacking cough, especially troublesome at night. This cough may be much abated by the topical application of morphia dissolved in glycerine, honey, or treacle, or some other viscid substance, which causes the mixture to linger some time over the irritable membrane. It is well known that the cough of chronic phthisis may often be best treated by directing the patient to retain a weak solution of morphia in glycerine, honey, or mucilage, for some time in the pharynx, so as to blunt the irritability of these parts, and so allay the cough. Hence, too, the excellent effects of morphia lozenges allowed to dissolve slowly in the mouth. Even over coughs entirely dependent on lung disease, opium or morphia, administered so that the medicine clings for some time in contact with the structures just outside the larynx, appears to have a greater influence than when the medicine is quickly conveyed into the stomach. This fact has its explanation probably in the influence, heretofore insisted on, that drugs appear to possess remedial virtues over the organs of the body even when applied only to the orifices of passages leading to them.

The following is a good formula for coughs: Morphia, one-fortieth part of a grain; spirits of chloroform, three minims, in a drachm of glycerine, syrup, diluted honey, or treacle, repeated frequently, at times only when the cough is troublesome, till the paroxysm is subdued. The mixture only allays, but does not cure the cough.

Taken into the stomach, opium lessens both its secretion and its movements, and consequently checks digestion. Here we have a sufficient reason why opiates should not be given shortly before or after a meal, unless indeed it is intended to diminish appetite or hinder the natural movements of this organ.

Opium is very useful in diabetes to control inordinate appetite. By diminishing the quantity of ingested food, it reduces the excretion from the kidneys, and abates the troublesome thirst. Opium, however, exerts no further influence ; still in this indirect way opium is often very serviceable.

Opiates not uncommonly excite nausea and vomiting, symptoms very apt to occur in the morning after a night dose.

Opium, or its alkaloid, morphia, is given to quell the pain of many stomach affections, and for checking the vomiting which may accompany them. Thus it is useful in cancer and chronic ulcer of this organ, and in chronic gastritis from excessive indulgence in alcoholic drinks. Morphia, in small doses, combined with tonics, taken a short time before meals, is very efficacious in removing the pain, the nausea, and want of appetite so often connected with alcoholism. Graves employed morphia in small doses, combined with bismuth, in the treatment of gastrodynia with heartburn.

The effects of opium on the intestines are identical with those on the stomach; that is to say, it checks both secretion and movement, thus constipating the bowels in health, and restraining diarrhœa in disease. Constipation, one of the disagreeable consequences following an opiate, is much less marked when morphia is employed hypodermically.

Opium, or its alkaloid, morphia, is very frequently and very beneficially given in both acute and chronic diarrhœa. It is useful in the acute forms, after the expulsion of the disturbing irritant. It is, moreover, of great use in the chronic diarrhœas of tuberculosis, dysentery, and other organic diseases.

In typhoid fever, opium, in small doses, given at night, may serve a double purpose. In wakefulness, with delirium, whether of the boisterous or muttering kind, opium will often produce sleep, and thus check the delirium, while at the same time it will control or even subdue the diarrhœa.

There is a form of dyspepsia and diarrhœa which yields to small doses of opium. In this affection there is probably increased peristaltic action of the stomach and intestines, so that the food, soon after it is swallowed, is forced in a half-digested state through the pylorus into the intestines, where, owing to its crude condition, it acts as an irritant, exciting the vermicular action already acting unduly, so that a diarrhœa of partially digested food occurs soon after a meal. The patient suffers from a sensation of emptiness and hunger, which is relieved for a short time by food; but the meal being imperfectly digested, and expelled through the anus long before it can be absorbed, the system is imperfectly nourished, and these uncomfortable symptoms soon recur. The characteristic symptoms are—sinking at the stomach, relieved for a short time by taking food, and the occurrence of an evacuation of partially digested food immediately after a meal, nay, sometimes even before it is finished, and generally at no other time. This complaint, perhaps the most common form of chronic dyspepsia in children of six to twelve years of age, is quickly arrested by administering from two to five drops of tincture of opium a few minutes before each meal, which seems to check the excessive muscular action, and so enables the food to tarry a sufficient time to undergo digestion. Still more effective is arsenic in this condition.

Colic of the intestines is well combated by small doses of opium or morphia frequently repeated. As this painful affection is generally accompanied by, and is dependent on, constipation, a purgative should likewise be given. The opium assists the purgative by relaxing the contraction of the intestines, hindering the passage of the intestinal contents.

Opium quiets the intestinal movements in inflammation of the peritoneum and of the intestines, or in wounds of the abdomen.

Opiates are administered by the rectum for a variety of purposes. Laudanum is usually injected, mixed with an ounce of decoction of starch, at a temperature of 100°, or thereabouts, and is very effectual in checking acute and chronic diarrhœas; and in those severe forms of diarrhœa which sometimes carry off young children in a few hours, an injection of this kind is often the speediest way of controlling the dangerous flux. When other methods have failed, the same injection often checks the purging of typhoid fever, or of tubercular ulceration of the intestines, or of dysentery. It is highly useful in pain of the bowels and of the organs in the neighbourhood of the rectum. Thus an opiate injection will generally subdue the pain and frequent micturition of cystitis, and the pain arising from various uterine diseases. Sometimes a suppository of opium or morphia is introduced into the rectum as far as the finger can conveniently carry it, but the injection of the laudanum and starch is more effectual.

Opium mixed with gall ointment is an excellent application to painful bleeding piles, and to fissures of the anus, which cause excruciating pain with each evacuation. Mild purgatives should be simultaneously employed.

Opium injected into the rectum is absorbed, and affects the distant organs of the body. Sometimes a rectal injection will induce sleep when the ordinary method of administering it by the mouth completely fails. In obstinate forms of dyspeptic sleeplessness, or the wakefulness of convalescents from acute disease, the injection of laudanum by the rectum may be tried, and will often prove successful. Both Dupuytren and Graves state that this mode of giving opium is preferable to its administration by the mouth, in delirium tremens and in traumatic delirium. The dose of laudanum injected into the rectum must depend on the nature of the case. If employed to relieve local pain, a small quantity will generally suffice; but to produce sleep a dose must be given about three or fourfold that administered by the stomach—at least, so it is generally taught; but an ordinary medicinal dose, even when given by the rectum, is often amply sufficient to ensure sleep, if the rectum is well cleared out previously by a simple enema or a purgative.

The active principles of opium readily pass unaltered into the blood; for, whether the opium is swallowed or injected under the skin, it induces the same symptoms.

To one unaccustomed to opium a small dose produces "a soothing and luxuriant calm of mind, followed in the course of forty or fifty minutes by a disposition to sleep;" if this does not happen, it gives "general repose of both mind and body, undisturbed by pain." The pulse at first quickens, but soon becomes slower. The mouth and pharynx are dry, and perspiration often breaks out. Larger doses, as from two to three grains, generally produce effects much more decided; at first much excitement, with noises in the ears, and closely contracted pupils. The ideas are confused and extravagant, nay, decided delirium may occur; the head feels heavy and full, and the senses lose their acuteness. Sleep soon follows, which is often heavy, even stertorous, and harassed by disagreeable dreams. The pulse, at first full and frequent, soon becomes slow.

The susceptibility to the action of opium, and the symptoms it produces, vary greatly in different persons. Some are so easily affected by opium that even a small quantity endangers life; a susceptibility so extreme is, however, not common. In some it produces only agreeable feelings and ideas, in others just the reverse; in some the stimulant effects predominate, in others the narcotic.

After a poisonous dose the primary stage of excitement is very brief, and narcotism rapidly supervenes. Great giddiness and a sensation of oppression comes on, with an irresistible craving for sleep. There may be both nausea and sickness. The sleep soon passes into profound insensibility, the breathing grows slower and slower, more and more shallow, till it ceases. The face is livid and bloated, and the veins swollen. The pulse, at first full and strong, becomes small, feeble, and thready. The pupils are very greatly contracted. The power of swallowing is gradually lost, the pupils become insensible to light, the muscles relaxed, and the patient cannot be roused from his state of profound insensibility. Mucus collects in the throat, and at last, the breathing ceasing, death occurs.

Patients may die in a state of collapse, and not from asphyxia, though death usually happens from paralysis of the respiratory muscles.

In opium poisoning a variety of other symptoms occasionally occur, as diarrhœa, diuresis, convulsions (most common in children), lock-jaw, dilated pupils, or one is dilated while the other is contracted, and itching and dryness of the skin.

In some respects opium poisoning simulates apoplexy, drunkenness, and uræmic coma.

Opium poisoning may be generally discriminated from apoplexy by attention to the following points: history of the attack, odour of breath and vomited matters, state of the pupils, and age of the patient. The pupils in apoplexy are very generally dilated, and are often unequal; moreover it rarely occurs in youth.

Only cases of a profound intoxication put on a superficial semblance of opium poisoning. In each case there is great insensibility; but if the drunkard can be roused, he answers a person's questions incoherently; but poisoned by opium, although he is slow to speak, yet his answers are rational and to the point. The breath and vomited matters will very often tell if alcoholic drinks have been taken; but it must be recollected that suicides by laudanum not uncommonly take it in beer or other drinks, but even then the odour of the laudanum may generally be detected. In opium poisoning the pupils are much contracted; but in profound drunkenness the pupils are widely dilated. Moreover the early symptoms of the attack are sufficient to enable us to decide between opium and alcoholic poisoning.

Uræmic coma may occur very suddenly, and without any, or scarcely any, dropsy. To distinguish such a case from opium poisoning, the history of the attack should be ascertained. A patient in uræmic coma can generally be roused partially, when some information may be extracted from him. An analysis of the urine, moreover, may throw much light on the case, while the state of the pupils precludes suspicion of poisoning by opium.

Effusion of blood into the pons Varolii will produce symptoms almost identical with those of opium poisoning. Thus in both cases there is profound insensibility, with closely contracted pupils, and slow, stertorous breathing. It may be impossible to discriminate between these two conditions till a *post-mortem* examination reveals the real cause of death.

In poisoning by opium, *use the stomach pump, rouse the patient, and keep him constantly moving to prevent sleep;* give strong coffee, apply *cold affusion to the head*, and, if necessary, adopt artificial respiration.

It is not an uncommon practice to give brandy or wine to the patient recovering from the effects of a poisonous dose of opium, with the view of overcoming drowsiness; but the author, having watched the action of alcohol under these circumstances, always found that it greatly increased the sleepiness, and in fact did harm.

In this country the habit of opium-eating is not so largely indulged in as among Asiatics; but it is practised here in some localities to a startling extent. Though carried to a very great pitch, this practice produces in some individuals neither physical nor mental weakness, while in other persons the body wastes, and they grow physically and mentally weak, irritable, fretful, and desponding, especially when the opium is withheld; the memory is much impaired; the skin becomes sallow; but, strange to say, in many cases the bowels are not constipated.

The horrors which opium-eaters suffer when the drug is withheld are well known, and need not be dwelt on here; so great indeed is the suffering, that few have sufficient resolution to relinquish the habit. The amount of opium taken is often enormous. De Quincey took 320 grains daily!

When taken in moderation, the habit is perhaps not more prejudicial to health than tobacco-smoking. Thus the Chinese are almost universally addicted to the habit of opium-eating, and yet they are an intelligent and industrious race.

In fevers, whether inflammatory or specific, sleeplessness, quickly wearing out the strength, is often one of the most dangerous symptoms. Want of sleep produces either noisy and furious delirium, as is frequently seen in typhus fever, or wandering and muttering, with picking of the bed-clothes, twitching of the muscles, and great prostration. In either case, opium, judiciously given, may save an almost hopeless life. Where the delirium is of the furious kind, it is well to combine the opium with tartar emetic, as this combination calms the excitement, and produces sleep more speedily and effectually than opium given alone. Graves gave three or four drops of laudanum and one-sixth to one-eighth of a grain of tartar emetic every two hours till tranquillity and sleep were produced. In very boisterous delirium he increased the tartar emetic. Now-a-days, however, morphia hypodermically administered is found to act more certainly and speedily, without deranging the stomach or intestines.

Laudanum may be given alone with signal benefit in muttering delirium, with muscular tremors and great prostration. A grain of morphia or a drachm of laudanum is mixed with four ounces of water, and a tea-spoonful of this mixture is given every five or ten minutes, till three or four doses have been administered. If by that time the patient is not asleep, the medicine should be intermitted for half an hour. If after the lapse of this time sleep does not come on, a few more doses should be given in the same way. This method often insures calm, refreshing, invigorating sleep, lasting several hours, out of which the patient wakes free from wandering, refreshed, the appetite and digestion improved, and the skin comfortably moist. Sometimes, however, it answers better to give a single moderate dose.

Any one who has watched the action of opium on a patient in extreme weakness, with sleeplessness, twitching and tremor of the muscles, and quivering dry brown tongue, must have been struck by the fact that the administration of laudanum helps a patient over this critical stage with far less consumption of alcoholic stimulant than would otherwise be required. It need scarcely be said that in many cases brandy or wine must be freely given with the laudanum.

In delirium tremens, opium does great service by producing sleep. It answers best when employed hypodermically. If the patient is strong, the delirium boisterous, the pulse full, then tartar emetic or tincture of aconite may be added to the opium. It is convenient to administer the opiate with porter or spirits, this combination apparently heightening its action, while it is more readily taken by the delirious patient. It has been already mentioned that opium in delirium tremens sometimes acts more efficiently when given by the rectum.

Acute mania in many instances may likewise be treated advantageously by opium and tartar emetic. (See Chloral.)

Dr. Graves has well pointed out that when opiates are employed as hypnotics, attention should be paid to the time of their administration. They should be given at the usual time for sleep, or when the patient feels inclined to doze, so that the medicine may come in aid of nature, herself tending to the same end. For example, in chronic wasting disease, accompanied by hectic, the opiate should be given very late at night; for then there is no inclination to sleep till the early morning hours. Opium mostly produces its narcotic effects about one or two hours after it is administered. The chronic sleeplessness without any very notable disease should not be treated with opium, if it is possible to avoid it; but the cause of it should be removed. Dyspepsia and uterine derangements are constant causes of sleeplessness. Here chloral and bromide of potassium are much superior to opium.

Opium will of course relieve or abolish pain; yet in the treatment of chronic cases it is right to exhaust all other methods of easing pain; for the opiate soon loses its influence, and must be given daily in larger quantities, until the patient quickly becomes accustomed to it, and cannot, without great discomfort, discontinue it, even after permanent removal of the pain.

Opium, especially when employed hypodermically, is often of great service to relieve pain and to ensure sleep in acute rheumatism.

Opium is often of signal use as an antispasmodic. Its action in this respect, as well as its narcotic power, is much enhanced if given with a stimulant, as alcohol, ether, or chloroform.

Laudanum or morphia is of marked service in the convulsive stage of whooping-cough. A sufficient dose should be given to the child to produce very slight heaviness; this state should be maintained by giving one-fiftieth of a grain of morphia every three or four hours, or a proportionate dose every hour. A quarter of a drop to two drops of laudanum, according to the age of the child, must be given every hour. This treatment often quickly removes the whoop, and reduces the severity and frequency of the cough; but in the case of any irritation, as of teething or of worms, tuberculosis or much bronchitis, then this remedy, like most others, is of little or no use. (See Belladonna, Lobelia, Bromide of Potassium.)

Opium and its preparations are beneficial in renal and biliary colic. Morphia answers best when employed hypodermically. If adminstered by the mouth, small doses of the opiate chosen, combined with spirits of chloroform, should be administered every five or ten minutes, till the pain gives way.

Opiates are also beneficial in some cases of asthma; yet morphia, with some asthmatics, will induce a paroxysm of dyspnœa.

Opiates are also used in spasmodic stricture.

Opium and its preparations are reputed to check the secretion from all the mucous membranes of the body, and on account of this property are given in bronchitis to check excessive secretion of mucus and pus.

Opiates are employed as diaphoretics.

It is well known that opium, in a small dose taken at night, will, if resorted to at the commencement of the attack, cut short a cold in the head. Some attribute its efficacy to the influence it exerts on the skin, and Dover's powder is very generally employed in such colds; but it is well known that two or three drops of laudanum, taken at bedtime, is often sufficient at once to abolish a threatening attack of cold in the head. It is useful to assist the action of the opium by a glass of hot grog.

Laudanum, especially when mixed with tincture of nux vomica, is very serviceable in some of the distressing symptoms which afflict hysterical women, or nervous, over-worked, anxious men. Both men and women, but chiefly women, about forty or fifty years of age, complain of a sensation of great weight and heat on the top of the head, with frequent flushings of the face, suffusion of the eyes, hot and cold perspirations, and sometimes shooting pains passing up the back of the head, occasionally centring in one brow, with much heaviness and torpor after meals, and now and then the sensations as of a tight cap on the vertex, or dull aching pain in the same part, with inability to fix the attention, and much depression of spirits. The occurrence of these symptoms may generally be traced to a variety of causes, as dyspepsia, especially the flatulent form, heart-burn, uterine derangements of various kinds, or unhygienic conditions of life. These causes must be treated, and, when practicable, removed. In any case the foregoing symptoms may generally be dissociated from the disease with which they are connected, and the patient much relieved by a drop of laudanum, with two of the tincture of nux vomica, repeated three or four times a day.

Morphia occasionally produces an eruption, sometimes like that of measles, at other times like that of nettle rash; it may be accompanied by distressing itching, sufficient often to counteract the anodyne properties of the medicine.

In profuse flooding after parturition, accompanied with much exhaustion of the uterus, tincture of opium in a large dose (℥j) mixed with brandy is recommended.

The influence of opiates on the urine of diabetes has been already pointed out.

The preparations of opium diminish the water and urea of healthy urine, probably by lessening the appetite, and hindering digestion. Morphia passes out in part by the urine.

Under the influence of opium, the urine is sometimes retained in the bladder for several days.

It is important to bear in mind that the active principles of opium pass out with the milk, so that a child at the breast may be dangerously affected by opium given to its mother.

Individual peculiarities, disease, age, and custom, modify the action of opium.

Of individual peculiarity we have already spoken, and disease, as is well known, often enables persons to tolerate very large doses of opium, especially in the case of severe pain.

Age influences the action of all medicines, but in an especial degree that of opium.

That medicines in the same dose should act far more powerfully on the young than the old, is only natural. Medicines, after their absorption, are mixed and diluted with the blood; and as the mass of blood is far greater in adults, this dilution is, of course, greater in them than in children. As a general rule, other things being equal, the dose of a medicine must be proportioned to the weight of the individual, provided there is not an undue development of fat; opium, however, is a notable exception, the susceptibility of young children to its action being far greater than its relative effects on adults. So great is the power of opium over persons of tender years, that great care must be taken in its administration.

The influence of custom on the action of opium has already been mentioned.

Morphia is generally considered to act on the body somewhat differently to opium. It is said to be less stimulating, and to produce less headache and nausea.

Some writers extol the narcotic virtues of codeia, asserting that, unlike opium, it produces calm sleep without disordering digestion, exciting nausea, constipating, or producing headache. Other observers consider it useless as a narcotic.

Narcein has been much recommended as more efficacious than morphia, as a hypnotic and sedative. It is said to produce no headache, to induce less perspiration than morphia, not to constipate, nay, in large doses to purge, rarely exciting vomiting, but often nausea and loss of appetite. One observer computes that narcein is four times weaker than morphia. It is stated this is the only alkaloid of opium which does not produce convulsive movements.

Narcotine, in doses of one to three grains, is asserted to possess antiperiodic properties. Some consider it even superior to quinia in ague.

The investigations of Claude Bernard have led him to arrange the constituents of opium into three classes; namely, the soporific, the convulsant, and the toxic. He thus arranges the constituents in the order of their activity :—

Soporifics.	*Convulsants.*	*Toxics.*
Narcein	Thebaia	Thebaia
Morphia	Papaverine	Codeia
Codeia	Narcotine	Papaverine
	Codeia	Narcein
	Morphia	Morphia
	Narcein	Narcotine.

For further remarks on the action of thebaia, codeia, narcotine, and morphia, see Strychnia.

NUX VOMICA.
STRYCHNIA.
BRUCIA.
THEBAIA.

THE three alkaloids, strychnia, brucia, and thebaia, appear to exert a similar action on the spinal cord, so that for convenience sake they are grouped together; but it must be stated that strychnia is more powerful than brucia, and brucia than thebaia. The remarks which follow apply mainly to nux vomica and its alkaloids, as thebaia has not yet been put to any therapeutic application.

It was formerly an occasional custom to blister the skin over paralyzed muscles, and to apply strychnia to the raw surface, with the hope of producing a greater effect on the diseased muscles than when the medicine is swallowed. This method has now fallen into disuse, being superseded by the hypodermic injection.

Dr. Anstie recommends the hypodermic injection of strychnia in 1-120th of a grain doses to relieve the pain of cardialgia and gastrodynia, knowing, he says, "at present no such remedy for gastralgia as this."

The preparations of nux vomica have an intensely bitter taste, and, like other bitters, augment the flow of saliva.

They produce a sensation of hunger, but there is no evidence that strychnia or any other bitter substance increases the digestive power in a healthy person. Like other bitters, and perhaps more efficaciously, these preparations, by their slight irritant action, obviate departures from health of the gastric mucous membrane, and under such circumstances promote digestion. The action of these preparations, and especially of the tincture of nux vomica, which for this purpose is far the best and most agreeable, is well shown in certain perverted conditions of the digestive canal. For example, in the course of chronic diseases, such as bronchitis or dilated heart, or cirrhosis of the liver, the tongue is not unfrequently thickly coated with a white fur, and the state of the digestion indicates that the stomach is in a state of chronic catarrh. The exhibition of one or two drops of the tincture of nux vomica in a tea-spoonful of water, every two hours or oftener, for twenty-four to forty-eight hours, will often clean the tongue and improve the digestion, thus clearing the way for the administration of nourishment at a critical time. Again, during early convalescence, when the tongue still continues coated, and the digestion weak, nux vomica will improve the condition of the digestive organs, and prepare the way for stronger tonics and more liberal diet.

This treatment greatly mitigates the annoying flatulence and indigestion occurring in cases of mechanical obstruction of the circulation in the digestive organs, as from cirrhosis and dilated heart; indeed, nux vomica is more or less serviceable in flatulency of any kind. Heartburn, too, frequently yields to small quantities of the tincture given three or four times a day.

Nux vomica is of great service in a group of symptoms, including weight at the pit of the stomach after food, acidity and heartburn, flatulence, accompanied by heat and weight at the top of the head. This last symptom occurs usually in women, especially about middle age. This dyspeptic condition is often benefited by five drops of the tincture of nux vomica taken about a quarter of an hour before food three times a day. The heat and sensation of weight on the top of the head, even when occurring independently of any gastric disturbance, often yields to the same treatment.

In acute gastric catarrh, accompanied by "sick headache," the action of tincture of nux vomica is often very conspicuous. This common and troublesome complaint is sometimes traceable to error in diet, or constipation, but it occurs often without any apparent cause. Headache is often the most prominent symptom, the sickness and nausea being very slight, amounting only to mere qualmishness. A drop of the tincture in a tea-spoonful of water, taken every five or ten minutes, to the extent of eight or ten doses, and then continued at longer intervals, often quickly mitigates these headaches, and in a few hours removes them, when otherwise they would continue severe all the day.

The tincture or extract of nux vomica has long been employed to remove constipation, habitual or temporary. The extract, variously mixed with other remedies, as rhubarb or colocynth pill, should be taken daily, a little time before dinner, to aid both digestion and the proper unloading of the bowels. Or the same effect can often be obtained by the employment of one or two drops of the tincture twice or three times a day; this small quantity often proving amply sufficient to ensure daily one comfortable motion. From our want of knowledge of the exact circumstances indicating its employment in cases of constipation, it seems to be capricious in its action, and it is as well, therefore, not to be too sanguine of its success. In some cases it answers beyond all expectation, while in other apparently similar cases it fails as completely. If the sluggishness of the bowels has been of long continuance, and is very obstinate, the patient should take occasionally, early in the morning, half a tumblerful of some natural purgative water to assist the nux vomica. Should the tardy action of the bowels be due to an insufficient supply of bile, the motions being pale in colour, the preparations of nux vomica will fail, and other more appropriate medicines are required.

Strychnia, as Mr. Savory has shown, is much more poisonous when injected into the rectum than when swallowed, a curious difference not owing to the digestion and destruction of the alkaloid by the gastric juice, as Mr. Savory has proved that this secretion exerts very little, and probably no effect, upon strychnia.

Strychnia and the other active principles of nux vomica quickly enter the blood, as is shown by the rapidity with which a poisonous dose is followed by characteristic symptoms. Moreover, the alkaloid can be extracted from the blood and urine, a conclusive proof of its absorption.

A large and poisonous dose produces symptoms very closely resembling those of tetanus. The first symptoms are general uneasiness, with restlessness and soreness of the limbs. Shooting pains like electric shocks occur in various parts of the body, often first in the back, and down the arms and legs. Tetanic and paroxysmal contractions of the muscles soon set in, which rapidly grow worse, make the body rigid while the paroxysm lasts, and completely arrest the respiratory movements, so that the face becomes bloated and livid, the jugular veins stand out in the neck, the eyes are staring and prominent, the jaws are firmly clenched, and the pupils dilated. Each spasmodic attack lasts from a few seconds to a minute or more, and then generally ceases altogether for a time. Throughout the paroxysms, the mind is quite unaffected, and the patient's sufferings are agonizing. A breath of air, a slight noise, or movement of the bed-clothes, the most trival cause, will excite tetanic spasms. In a fatal case death is rapid; and if the patient survive two or three hours, sanguine hopes of his recovery may be entertained. A fatal termination may be due either to exhaustion from the repeated convulsions, or to asphyxia from spasm of the muscles of the chest.

Brucia, thebaia, and most of the opium alkaloids affect the body in the same way.

The symptoms of strychnia poisoning differ from those of tetanus in the following particulars:—From the first they are very strongly marked, and rapidly reach their worst, perfect intermissions occur, and death soon takes place, or the symptoms rapidly decline, and the patient recovers.

Treatment of poisoning.—*Stomach pump*, when it is available in time; for after tetanic symptoms have set in, the introduction of the stomach tube would excite a paroxysm. *Animal charcoal. Tannin.* Solution of iodine. *Chloroform inhalation.* Injection of curare, or of methyl and ethyl compound of strychnia, of brucia, or of thebaia. Artificial respiration. Fats.

Strychnia excites tetanus by its effect on the cord, not through the brain; for in poisoning by strychnia the mind, to the last, remains unaffected, and animals can perform voluntary movements between the paroxysms. Nor does it tetanize through the muscles or nerves; for after division of one sciatic nerve, strychnia excites tetanus in every part of the body except in the limb supplied by the divided nerve; yet as the vessels of this limb are undivided, its unconvulsed muscles and nerves are as much poisoned by strychnia as those parts which are convulsed. As strychnia tetanizes neither through the brain, muscles, nor nerves, it must act through the cord. Since tetanus depresses the functional activity of the motor nerves and muscles, the motor nerves and muscles of a tetanized limb, the one conveying and the other responding imperfectly to stimuli, it would seem that strychnia paralyzes these parts in some degree; a surmise apparently strengthened by the fact that the tetanized muscles quickly become stiff from rigor mortis. Kölliker, however, has shown that tetanus depresses the functions of the motor nerves and muscles through the excessive activity they have been made to undergo. On division of the sciatic nerve, Kölliker found that the posterior limb was not convulsed, and that the motor nerves of this limb retained perfectly their power to conduct impression, and the muscles to contract on stimulation. Kölliker is of opinion that the afferent nerves are unaffected by strychnia.

Harley's experiments show that the poison acts on all parts of the spinal cord. Its effect on this organ appears to be twofold. It dilates the vessels, and thus increasing the supply of blood, augments the activity of the functions of the cord. But apart from this property of dilating the vessels, it is supposed that strychnia exerts a direct stimulating influence on the spinal cord, although, as Harley has shown, it can act only through the blood, and does not, as was formerly supposed, exalt the functions of the cord when divested of all its vessels, and when a solution of strychnia is brought into direct contact with its elements.

It is stated that traumatic and strychnic tetanus produces minute ecchymoses in the cord; but this is not the case with tetanus in frogs excited by strychina; for these animals may be kept tetanized for weeks without the production of ecchymoses,—a fact proving that they are the result, and not the cause, of the tetanic spasms.

Kölliker asserts that the blood heart of frogs is but little affected by strychnia.

Nux vomica or its alkaloid is commonly employed in motor paralysis, and often with great benefit. It is sometimes administered with the view of exciting slight twitchings in the paralyzed muscles, so as to keep up a sort of artificial exercise to maintain their nutrition, and prevent their wasting. But if strychnia benefited in this way, surely galvanism would effect this object better. Dr. Brown-Séquard recommends nux vomica or strychnia in those forms of paraplegia dependent on softening and wasting of the cord, as when the vessels are degenerated and partially blocked up, and the supply of blood conveyed to the cord is diminished. It is supposed that the strychnia dilates the vessels, and so increases the supply of blood in the degenerated tissues, and averts their further destruction.

Strychnia sooner affects paralyzed than unparalyzed muscles.

Strychnia in medicinal doses is said to strengthen the beating of the heart. It has been shown that the heart of an animal poisoned with strychnia ceases sooner to contract after death than that of an animal destroyed by mechanical means; and further, that if a frog's heart is placed in a solution of strychnia, it ceases to beat sooner than another placed in simple water. It is not said whether this organ ceases to contract in the systole or diastole. Harley states that if a solution of strychnine is dropped on a heart, its muscles become tetanic. The same authority says that both strychnia and brucia lessen the absorption of oxygen, and the production of carbonic acid; in other words, it lessens the respiratory function of the blood. Thus, if either of these alkaloids is mixed with blood recently drawn, the amount of oxygen it absorbs, and of carbonic acid it gives off, is less than that of simple blood. Is it not probable that any substance which will alter the physical or chemical condition of the blood will lessen its respiratory function?

When strychnia is given to rabbits with young, it causes them to abort; whence it has been concluded that it possesses a direct influence on the uterus, but there is no evidence to confirm this conjecture.

Nux vomica is useful in prolapsus ani. If the prolapsus is associated with constipation, the nux may be added to a purgative, as tincture of rhubarb. In case of diarrhœa, this should be checked, when the prolapsus will probably cease; but if not, strychnia will generally quickly succeed in curing a child of this troublesome complaint.

These preparations, and especially the tincture, are often of much use in the so-called hysteria met with in middle-aged people. It appears in many cases to control the distressing flatulence which is commonly connected with this state, and relieves such patients of the sensation of heat and weight on the top of the head, and often removes effectually, although less surely, the flushings of the face and hot and cold perspirations. Combined with small quantities of laudanum it is still more effectual.

Dr. Anstie has noticed that strychnia sometimes produces symptoms closely resembling intoxication. This peculiar effect manifests itself in unsteadiness of gait, perversion of the intellect, and a meaningless smile. On one occasion the author was able to connect a peculiar wandering delirium at night with the employment of strychnia. In this case there were no tetanic twitchings.

Dr. Anstie is of opinion that strychnia promotes capillary circulation; hence he recommends it in troublesome coldness of the hands and feet.

Strychnia sometimes induces persistent erections, which phenomenon has led some medical men to give it in impotency and spermatorrhœa.

Strychnia is sometimes employed with much benefit in paralysis of the bladder in old people whose water constantly dribbles away. It may be useful in the incontinence of urine of children.

Strychnia is separated in part, at least, by the kidneys. Its influence, if any, on the urine has not yet been ascertained.

Drs. Crum, Brown, and Fraser, in a remarkably able paper, have recently published some experiments made with methyl and ethyl compounds of strychnia, brucia, and thebaia, and have arrived at some astonishing results. While retaining most of their chemical properties, giving the ordinary reäctions of strychnia, brucia, and thebaia, yet the physiological action of these substances on the body is completely altered. These observers experimented with iodide of methyl-strychnium, sulphate of methyl-strychnium, and with the nitrate and hydrochlorate of the same base; likewise with iodide and sulphate of methyl-brucium, and with iodide and sulphate of methyl-thebaium.

Strychnia, brucia, and thebaia, as we have already stated, affect the cord, and produce, according to the dose, more or less severe tetanic convulsion. But these substances, when converted into the ethyl and methyl compounds, cease to act in this manner, but produce general paralysis of the body, an effect shown by these experimenters to depend on paralysis of the ends of the motor nerves; that, in fact, these new compounds act on the body in the same way as curare.

In their action on the heart and muscles, these new substances were likewise found to differ much from strychnia, brucia, etc.; for, after poisoning by the methyl or ethyl compounds, the heart continued to contract naturally for a long time, while the muscles for many hours continued flaccid, contractile, and alkaline.

These observers further experimented on codeia, morphia, and nicotia. At the conclusion of their treatise they say—"The change in the character of the physiological action is remarkably illustrated by strychnia, brucia, and thebaia, whose purely spinal stimulant action is converted into a paralyzing action on the periphery (end organs) of motor nerves; it is apparent in codeia and morphia, whose convulsant action is also converted into a paralyzing action on motor nerve-end organs, and whose hypnotic action is apparently altogether destroyed in the case of codeia, and certainly greatly diminished in that of morphia; and it is obvious, though less so than with the others, in the case of nicotia, whose convulsant action is diminished, if not altogether removed. We may conclude from these facts that when a nitrile base possesses a strychnia-like action, the salts of the corresponding ammonium bases have an action identical with that of curare.

"It is well known that curare and strychnia are derived from plants belonging to the same genus, and it is therefore interesting to observe such a relationship. It may not, however, be altogether superfluous to add that strychnia, brucia, and the other spinal stimulant alkaloids examined in this paper, have not been converted by chemical addition into curarina—the active principle of curare. The action of the methyl derivatives of these bases is of precisely the same character as that of curare, and they possess the same peculiarity of slow absorption by the mucous membrane of the digestive system, but the degrees of their activity are very different. If we confine our attention to the salts of the methyl derivatives of strychnia, brucia, and thebaia, where the action is uncomplicated, we observe they form a series in which the fatal dose varies for each, while this dose, in the case of the most active of the three, is considerably above that of curare, and greatly above that of curarina. Besides, curarina has a characteristic colour reaction that belongs to none of these bodies, and the latter further prove this dissimilarity by each of them possessing special colour reactions, by which they may be distinguished from each other."

LOBELIA INFLATA.

This remedy has been both highly praised and as strongly condemned; for with some it has answered beyond expectation, but to others it has yielded nothing but failure and disappointment. This discrepancy of evidence may be reconciled; for it will be found that the medicine has been given in very different doses by the two differing sets of authorities. Unless given in large doses—doses considered by many, without any foundation, as poisonous—this remedy is inoperative. Many erroneously consider that lobelia is a highly poisonous and dangerous drug, which must be given with much caution and close watching.

Lobelia will be found of great service in many cases of asthma, whether dependent or not on visible structural changes in the lung. It is employed in paroxysmal dyspnœa, especially of that kind which occurs at night, apparently without any provocation, and lasts many hours, or, it may be, the whole night. If the difficulty of breathing comes on only on exertion, or results from a bad fit of coughing, lobelia is generally useless. This medicine being only remedial, and not curative of the conditions causing the dyspnœa, it should be given only during a paroxysm; on any signs of an on-coming fit the medicine must be taken immediately, in doses of a drachm of the simple tincture every hour, or even every half-hour, or ten drops may be taken every five or ten minutes, till the dyspnœa gives way. It is better to adopt the smaller and more frequent dose, as, if sickness or depression should occur, the medicine could be discontinued. The great drawback to this medicine is its uncertain action, some patients being made sick and faint by doses which others take without any such effect. It is well to inform patients of the possible occurrence of sickness and faintness, which may make them feel very ill; but these symptoms soon disappear, and never, so far as the author has seen, become serious or dangerous. Thus he has repeatedly given two-drachm doses without any dangerous consequences; but this large dose generally excites a sensation of sinking at the stomach, with nausea, and not unfrequently vomiting. It should be given with caution in heart disease, or this drug may render the pulse irregular and very weak. Lobelia inflata allays the dyspnœa which accompanies capillary bronchitis in emphysema.

In certain epidemics of whooping-cough lobelia is very serviceable, whilst in some epidemic forms it seems useless. Lobelia is useful in the spasmodic stage, and generally, in two or three days, reduces by one half the frequency of the attacks, lessening at the same time their severity. The speedy subsidence and disappearance of the whoop attest the influence of this drug. Like all other remedies for whooping-cough, it acts best in uncomplicated cases, and when the weather is warm and mild. If the weather is cold, and the winds cutting and sharp, it is necessary to confine the child to a warm room; but under other circumstances the child should live as much as possible in the open air. The author orders for a child two years old ten minims of the tincture of lobelia every hour, and an additional dose each time the cough is imminent, if it gives sufficient warning. Children bear large doses of the drug; for in no instance has the author witnessed nausea, sickness, or faintness, or any ill effects, follow the doses just recommended. He finds, indeed, that adults are much less tolerant of lobelia than children.* Sometimes, it is true, this medicine produces a slight burning sensation in the throat. Whooping-cough is well known to be a very obstinate and dangerous affection in children only a few months old, and in such cases lobelia often appears to do less good than in older children. The author gives five minims of the tincture every hour even to very young children.

Lobelia has been praised in bronchitis; the author has tried it in several cases; but while it removed any paroxysmal dyspnœa, it appeared to be powerless over the bronchitis itself. It has been employed in laryngismus stridulus and in croup.

CANNABIS INDICA.

ALL persons are not similarly affected by Indian hemp, and race and climate have been supposed to modify its influence. Its effects are most marked on the brain, whose functions it more or less perverts in various ways. It generally produces a pleasurable intoxication, and the dosed person becomes talkative, or sings, or perpetually giggles, and objects often assume to him very grotesque aspects, exciting him to much merriment. He is possessed with a feeling of happiness and contentment, and ideas of a pleasing kind pass with much rapidity through the mind, sometimes unconnected and immediately forgotten, but in other instances remembered on the return to the normal state. After a time sleep is generally produced, also accompanied with delightful dreams. There may be pain in the head, and "a sensation as of the brain boiling over, and lifting the cranial arch like the lid of a tea-kettle." General sensibility is also affected, and pricking in the feet, with numbness, often pleasurable in kind, is an early symptom. Pressure on the skin may excite a sensation of burning. After a time complete anæsthesia sets in, to such an extent that while standing there may be no consciousness of touching the ground. The muscular sense even is lost, and pain lessened or removed. Sometimes it produces complete catalepsy. It often occasions a ravenous sensation, which is not appeased by food. In some instances the pulse is said to be at first rather increased in frequency and strength, but neither pulse nor breathing is much altered. The pupils contract to light. Sometimes there is strong sexual desire.

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* Mr. Foster, of Huntingdon, and Dr. Howard Sargent, of Boston, America, recommend clover in whooping-cough. Dr. Sargent gives a wine-glassful occasionally through the day of an infusion made with two ounces of carefully dried blossoms of red clover, steeped in a pint of boiling water for four hours.

Such is the group of symptoms induced by Indian hemp, but they do not all occur in the same person, but are variously combined; and sometimes it produces sensations anything but pleasant, as nausea, vomiting, great thirst, frequent, weak, and intermittent pulse, with disagreeable sensations and ideas.

This drug is generally considered to act somewhat like opium, but to differ from it in producing nausea, constipation, or headache. It is not often employed as a hypnotic.

It has been given in a variety of diseases, but has hardly yielded the good results which were expected of it. It has been used in neuralgia, whooping-cough, and asthma. It appears to be useful in some cases of hysteria. Some give it a high reputation as a diuretic in acute and chronic Bright's disease, and consider it to be especially indicated when there is blood in the urine. It is further said to relieve dysuria and strangury, and to be useful in retention of urine dependent on paralysis from spinal disease. It is used occasionally in gonorrhœa.

Dr. Silver strongly recommends it in menorrhagia and painful menstruation.

ERGOT.

Ergot has a disagreeable, bitter taste, and occasions an abundant secretion of saliva. In large doses it produces nausea, vomiting, colic, diarrhœa, giddiness, headache, and dilatation of the pupil, great retardation and slight weakness of the pulse.

After its absorption into the blood it is supposed to cause contraction of the bloodvessels, and especially those of the cord, a statement made by Brown-Séquard, and noticed in the article treating of strychnia. It arrests various forms of hæmorrhage, as from the nose and lungs, and has been applied topically to check bleeding. If taken for some time, it sometimes produces spasmodic contractions of the muscles, and occasionally gangrene of the extremities, in character generally like semile gangrene. Both these consequences of ergot are very fatal.

Its effects are most expressed on the uterus, especially when pregnant. It excites in this organ powerful and continuous contractions. It is used in tedious labours, when the uterus is becoming exhausted, but must not be employed when there is obstruction to the passage of the child, otherwise it may occasion considerable damage to the delicate structures of the mother. Many suppose that it endangers the life of the child in two ways, namely, by subjecting it to powerful and continuous uterine pressure, and by weakening its heart. This injurious pressure may be avoided, it is said, by administering the medicine in small doses, so as to strengthen the natural contractions of the uterus, but not to make them continuous.

It is extremely useful in post-partum hæmorrhages, arresting the bleeding by producing firm contraction of the uterus. It is also of great use in the various forms of menorrhagia, even when it depends on tumours of the uterus. It is perhaps the most valuable medicine known in uterine hæmorrhage, checking the bleeding when other remedies have failed, and when the patient is reduced almost to a hopeless state. In such critical circumstances it must be given in full doses, and be repeated every hour or two. It promptly checks, and in a few hours effectually stays, the bleeding. Dry cupping over the sacrum is useful. Perfect rest should be enjoined.

It is stated to be useful in neuralgia and paraplegia, whooping-cough, incontinence of urine, and even in some cases of leucorrhœa.

The infusion is the best preparation. Two drachms of the freshly powdered ergot are to be infused for an hour in half a pint of hot water, and the liquid is to be given in table-spoonfuls every five or ten minutes. Or, if there be not time for this preparation, twenty drops of the liquid extract may be given every hour or two hours, according to the urgency of the case.

TEA AND COFFEE.

A STRONG infusion of tea is sometimes used in poisoning by tartar emetic or the alkaloids, for the sake of the tannin which precipitates these substances.

Few substances are more to be avoided in flatulent dyspepsia than tea. It is harmful in two ways; for tea itself in this complaint is found to promote the formation of wind; and women, the chief sufferers from this disagreeable form of dyspepsia, are apt to drink large quantities of weak tea, and the excess of fluid keeps up the distension.

Coffee is slightly purgative to some persons.

The active principle of tea and coffee is absorbed, and acts as a stimulant to the nervous system. These beverages are especially useful in a fatigued state of the system; indeed, under ordinary circumstances they are preferable to alcoholic drinks in this respect.

"Coffee," says Dr. Parkes, in his work on Hygiene, "is a most important article of diet for soldiers, as not only is it invigorating, without producing subsequent collapse, but the hot infusion is almost equally serviceable against both cold and heat; in the one case the warmth of the infusion, in the other the action of the skin, being useful; while in both cases the nervous stimulation is very desirable. Dr. Hooker tells us that in the Antarctic Expedition the men all preferred coffee to spirits, and this was the case in the Schleswig-Holstein war of 1849. The experience of Algeria and India (where coffee is coming more and more into use) proves its use in hot climates." The same authority, speaking of tea, says, "Tea seems to have a very decidedly stimulative and restorative action on the nervous system, which is perhaps aided by the warmth of the infusion. No depression follows this. The pulse is a little quickened. The amount of pulmonary carbonic acid is, according to E. Smith, increased. The action of the skin is increased, that of the bowels lessened. The kidney excretion is little affected, perhaps the urea is a little lessened, but this is uncertain,"

"As an article of diet for soldiers, tea is most useful. The hot infusion, like that of coffee, is potent against both heat and cold, is most useful in great fatigue, especially in hot climates (Ranald Martin), and also has a great purifying effect on water."

These beverages, especially coffee, are used in the headache of nervousness and of exhaustion, and as an aid in rousing and keeping awake in opium poisoning.

Although tea and coffee are very wholesome beverages, yet in some persons one or the other, or both, will occasion palpitation of the heart, with great sleeplessness and much mental excitement.

Coffee in certain individuals increases rather considerably the urinary water, and it is said to lessen the excretion of urea, and so to check metamorphosis; but Dr. Squarey's careful experiments disprove this conclusion with respect to urea.

CINCHONA AND ITS ALKALOIDS.

Salts of Quinia are protoplasmic poisons, arresting amœboid movements and the allied movements of the white corpuscles. Even weak solutions are highly poisonous to protozoa and infusoria (Bintz), more so even than salts of strychnia or morphia. Small quantities of quinia salts destroy septic germs, and arrest putrefaction, more thoroughly than most antiseptics, including even arsenic and creasote. Quinia, moreover, hinders alcoholic and butyric fermentations more than other bitters, with the exception of strychnia. Cinchonia possesses the same properties, but in a weaker degree than quinia.

Powdered bark contains, besides various alkaloids, a considerable quantity of tannin, which should be borne in mind when we administer bark, or any of its preparations.

Finely powdered bark has been applied, apparently with great benefit, to foul, indolent, sloughing, and even gangrenous ulcers. It is to be dusted thickly over the sore, and left to form a kind of poultice. Hospital gangrene has been successfully treated in this way.

Bark has been employed as a dusting powder to check profuse formation of pus, mucus, or the secretion of eczema. Its success probably depends on the tannin it contains, and other and cheaper preparations of tannin might prove equally useful.

Cinchona bark and its preparations are bitter to the taste, and, like all bitter substances, stimulate temporarily the salivary glands to an increase of saliva. The tannin of the bark precipitates the mucus of the mouth, and acts likewise as an astringent to the mucous membrane itself.

Powdered bark is a frequent constituent of tooth-powders.

The alkaloids, when swallowed in an insoluble form, combine with the acids of the gastric juice, and become soluble. So that, except for convenience, it is unnecessary to administer quinia and cinchonia with acids.

The alkaloids of bark probably undergo no other change in the stomach than that just mentioned. Their action in the digestive tract is similar to that of bitters generally, acting as slight irritants to the mucous membrane, and so producing, both in the mouth and stomach, an increase of mucus. It is generally stated that the gastric juice is for a short time, and to a small extent, increased in quantity by cinchona; and further experiments show that cinchona and its alkaloids check the digestion of food by the gastric juice, and also check fermentations, as that of sugar by yeast. The effects of cinchona, therefore, appear to be that it increases for a short time the production of both saliva and gastric juice, and so in a small measure may aid digestion; that it is an irritant to the mucous membrane, and promotes the secretion of mucus of the mouth and stomach; and that it checks the digestive action of the gastric juice and fermentation.

Our theoretical knowledge thus would appear to show that quinia neither increases appetite when the stomach is healthy, nor aids digestion in any great measure. Yet experience fails to support these theoretical conclusions; for even when the stomach appears to be healthy, quinine certainly seems to sharpen appetite and assist digestion, particularly in the case of inhabitants of large towns, and of elderly people.

These substances are useful to check unhealthy or excessive fermentation in the digestive canal.

If too long employed, these alkaloids disorder the stomach, producing heat and weight at the epigastrium, loss of appetite, nausea, sickness, and even diarrhœa. Poisonous doses excite great thirst, burning pain at the epigastrium, and vomiting.

Quinine appears to exert no influence on the secretion of bile.

These alkaloids affect the intestines in the same manner as the stomach.

They are given with benefit in cases of worms; but as decoction of cinchona appears to have no direct influence on ascarides and tæniæ, the good effects of quinia must be due to the improvement it effects in the mucous membrane, by preventing the production of the abundant mucus which favours the development and growth of these worms.

When quinia is taken in large quantities, some of it is said to pass off with the fæces.

Quinia readily passes into the blood, and probably very little is decomposed in the body, as it can be detected unchanged in the urine, sweat, and secretions of healthy persons and fever patients. It is almost exclusively eliminated by the urine, most of it being excreted in six hours.

Large doses affect sight and hearing, and subjective noises are heard, as of bells ringing in the ears, and occasionally deafness is produced. Sometimes, but very rarely, the sense of hearing has been lost for the rest of life; but usually in a short time, it may be in a few days, the noises cease, and the hearing again becomes natural. Large doses often dim the sight, and sometimes cause total temporary blindness. The author has noticed that on some occasions, strange to say, the defect of vision is limited to one eye, or begins first in one eye. The pupil of the affected eye is very generally dilated; sometimes to an extreme extent. Severe frontal headache, generally dull, heavy, and tensive, but sometimes agonizing, is one of the most distressing, as well as constant, symptoms following a large dose of quinia. While these symptoms last, and indeed generally before they appear, the face is flushed, the eyes suffused, and the expression is dull and stupid. Even small doses will produce some of the foregoing symptoms, especially the headache and mental disturbance, in some persons very susceptible to the action of this medicine.

It has become somewhat the practice of late to treat pyæmia, acute rheumatism, typhus fever, etc., with oft-repeated large doses of quinia, even to the enormous extent of several drachms in the day, yet without producing any of these toxic symptoms. Workers in barks sometimes suffer from a scaly papular eruption; sometimes from a vesicular weeping eruption; occasionally with great swelling of the genitals or of the face and eyelids, with redness of the eyes. They sometimes complain of great itching of the whole body, and it is known that quinia sometimes produces urticaria.

The statements concerning the influence of quinia on the pulse are discrepant. It is often said that large doses reduce, while small doses increase, the number of beats.

Mr. Gill and the author investigated the effect of large doses of quinia on the pulse and temperature. Their experiments were conducted on a boy aged ten, convalescent from rheumatic fever, and a healthy girl of thirteen.

Before experimenting on the girl, her pulse beat from sixty to sixty-four; and the following table shows the effect of a daily dose of quinia :—

Dose.	Rise began	Reached
gr. 8	in 35 minutes	94
,, 10	,, 15 ,,	72
,, 12	,, 95 ,,	72
,, 20	immediately	120
,, 20	in 50 minutes	96

In the last observation the pulse for about the first thirty minutes fell in frequency; but this did not occur with the other observations. We shall mention presently the depression in the temperature we obtained in the experiments; here it is only necessary to state that the pulse was at its fastest when the temperature began to be depressed by the quinia. The increase in the frequency continued after—

gr. 10	170 minutes.
,, 20	195 ,,
,, 20	Did not fall much.

On every occasion there was a loss of force with the increase in the frequency. Briquet has shown by the aid of the hæmadynamometer that the lateral pressure of the blood on the arteries is lessened in proportion to the dose of quinine.

The effect on the boy's pulse was different, for his pulse beat 112 to 120 in the minute. The rheumatism from which he had recovered had left a mitral regurgitant murmur, and very probably had damaged the heart's substance. Two doses of ten grains each were given him on one day, without altering the frequency of the pulse on either occasion; on each occasion, however, its strength was diminished. On another day, after taking a single dose of ten grains, the pulse fell during fifty minutes from 108 and 112 to 104 and 96, growing at the same time in strength. After this it attained a frequency of 120 in the minute, and again fell in force.

On two occasions the girl's pulse, when at its quickest, became irregular both in force and rhythm.

Mr. Gill and the author investigated at the same time the influence of quinia on the temperature of fever-free persons. The following table shows the results of our observations :—

BOY.

Dose.	Effect on Temperature.
gr. 10	None
,, 10	Fell 0·2°
,, 10	None

GIRL.

Dose.	Effect on Temperature.
gr. 8	Fell 0·2°
,, 10	None
,, 10	None
,, 20	Fell 1°
,, 20	Fell 0·4°

It appears that quinia possesses the power of reducing the temperature, but that to effect this in any appreciable degree large doses, to the extent of twenty grains, must be given, and even then the depression is only slight, and may not amount to half a degree Fahrenheit.

It may be said that the fall in the temperature does not represent the whole effect of the quinia, as a rise in the temperature would have taken place at the time the depression occurred, so that if we wish to learn the whole influence of the quinia we must add to the amount of depression the rise which should have happened; but to this the author is able to answer that on this point he made many careful observations, and found that the heat of the body remains always very constant between nine a.m. and four p.m., and the foregoing observations were made between these hours.

This table gives the time the depression occurred after the quinia, and the period it lasted. The occasions when the fall reached only 0·2° are not included, even when the greatest care is taken, since so slight a depression might easily be produced by accidental causes.

Dose.	Time.	Depression lasted
gr. 20	in 55 minutes	3 hours 15 minutes.
,, 20	,, 80 ,,	45 ,,

Other observers prove that quinia reduces the body temperature in health.

Piorry has shown that during a fit of ague quinine diminishes at once the size of the spleen. It is said that the drug exerts a similar effect on this organ during other fevers, and even in health.

The influence of cinchona and its alkaloids on the various forms of intermittent fever is well known. It controls this formerly common complaint more effectively than any known drug. How it acts is at present quite unknown. It has been supposed to check the fever by its influence on the spleen; but, granting this assumption, it yet remains to show how the influence of the quinia on the spleen prevents the return of the fever paroxysms.

Quinia generally arrests the disease at once. It is well, however, to bear in mind that this remedy may dissociate the other symptoms from the elevation of the temperature; or, in other words, it may remove the shivering, sweating, quick pulse, while the temperature may remain as great, or nearly as great, as on previous days. Mere rest will occasionally effect the same dissociation. This fact it is necessary to recollect, otherwise it may be concluded that with the removal of the more obvious symptoms the disease itself is cured, and thus the patient may be permitted to return to his usual avocations. Unless the unnatural elevation of temperature has been restrained, the paroxysms will speedily return.

A still more curious circumstance remains to be stated. It appears that quinia may check all the symptoms, even the periodical elevation of the temperature, and yet about the same time of day that the series of symptoms were wont to take place, an increase in the urea and urinary water may occur as marked as during a severe paroxysm; that is, all the symptoms of the paroxysm are absent except those pertaining to the urine.

One experiment made by the author renders it probable that quinia, given after the fit has begun, is powerless to prevent the elevation of temperature of that attack, although it may effectually prevent it in succeeding paroxysms. It is said that when employed subcutaneously after the paroxysm has begun, quinia will arrest the fit. Some hold that quinia is less efficacious than the powdered bark, even when the cinchonine is allowed for, and it is even held that powdered bark is more tonic than quinia. On the other hand, no doubt powdered bark, by reason of its bulk, and of the tannin it contains, frequently upsets the stomach.

There is great variation of practice regarding the administration of quinia. Some give small doses, repeated several times daily; others prefer a single large dose daily; both methods are useful, but under different circumstances. In the mild forms of ague, like those now met with in this country, small doses several times daily are sufficient; but in malignant forms of the disease, large doses, given even several times a day, may be required to arrest the disease summarily. Some say the drug should be given at the very commencement of the fit; but this advice is held to be bad, for thus employed it is said to make the immediate attack more severe.

Trousseau advised that fifteen grains should be taken immediately after the fit, and repeated with an interval, first of one, then of two, three, and four days, and so on. Probably this is a good way to extirpate the latent tendency to the disease, and to ensure a perfect cure; for it must be recollected that, judging only by the temperature, a patient may unconsciously undergo even a severe fit, a fact proving the great importance of employing the thermometer while treating this disease. Moreover, Trousseau's plan is judicious; for even when the quinine has removed all symptoms, the patient is liable to a recurrence of the attack from various causes, as depression of the health, or a sudden shock, as from an accident or operation; indeed, in many instances, this tendency to ague lasts for years.

It is important to recollect that the effect of quinia on the fit bears no relation to its physiological operation, either in time or degree, for a small dose may prevent the occurrence of a fit otherwise due twenty-four hours afterwards, the effects of the dose on the system meanwhile never becoming apparent, or having long ere this passed quite away.

Quinine is of especial use in the malignant forms of ague. The dose should be large, and given in a non-febrile period. In these severe forms of the disease, no circumstances are to be considered as contra-indicating its use. If it cannot be borne by the stomach, it may be given by the rectum.

In remittent fever, large and often-repeated doses should be administered during the remission.

The more recent the attack, the sooner and more certainly will quinia cure.

It is less efficacious in quartan than in other forms of ague, probably because old ague generally assumes the quartan type. In obstinate cases resisting quinia, arsenic often succeeds.

In some cases where this medicine appears powerless the administration of an emetic each morning sometimes brings the disease at once under the control of quinia.

Quinia is used as a preventive of ague, and in the navy it is a very useful sanitary precaution that sailors sent ashore where this fever prevails must take quinine before and after landing.

The other alkaloids of bark, although inferior to quinia, will check ague. Cinchona, it is said, must be given in doses one-third larger than quinine.

It is well known that diseases are often modified in their course, becoming intermittent in type, in persons who have suffered even many years ago from ague. In such cases quinine is often of great service.

Again, certain forms of neuralgia not uncommonly depend on malarial poison, and are then of a type distinctly periodical. Here quinia is highly serviceable in large doses given shortly before the expected attack. Quinia often proves useful too in non-malarial forms of neuralgia presenting this periodical character. Even when the element of periodicity is quite absent, large doses of quinia not uncommonly succeed in removing the pain of this distressing malady. Quinia is said to control neuralgia and ordinary face-ache more effectively when the powder is taken in minute quantities every few minutes,—for instance, as much as will adhere to the finger's tip dipped into the powder.

A short time ago it was the custom to treat pyæmia with large doses of quinia. It was said that the quinia in this disease produced great reductions in the temperature; but the author is convinced that the falls were normal, occurring in the course of the disease, and independently of the action of quinia. It is well known that in pyæmia a sudden and extensive rise of the temperature often occurs twice or three times a day, which, however, in a few hours falls again to the natural or almost natural standard.

Quinia is recommended in other febrile diseases, as typhoid fever, bronchitis, broncho-pneumonia.

In acute rheumatism quinia has been recommended in large doses of ten to thirty grains, repeated several times a day. Some advocate its use at the commencement, others at the termination, of the attack; in the one case with the view of shortening the course of the attack, and diminishing the chance of relapsing; and in the other case with the hope of preventing the profound anæmia which so generally accompanies acute rheumatism. Other authorities are altogether adverse to the use of this drug, maintaining that it favours relapses, and merely disguises the pain, but in no degree shortens the attack. Which side in this controversy is in the right, if either is, remains to be proved.

Quinia is often given with decided advantage, to check the profuse sweating of exhausting chronic diseases, as chronic phthisis. If a small dose fail to check this excretion, a large dose of six or eight grains, administered at once, or in portions, repeated hourly, sometimes succeeds.

A night draught, composed of quinine, sulphate of zinc, and sulphuric acid, is very useful in many cases of profuse sweating.

Quinia is sometimes useful in the vomiting of pregnancy.

In diseases of malnutrition, quinine is often employed with much benefit, as in impetigo and ecthyma. It is also of great benefit to the pale and badly fed of large populous towns. It is at present uncertain whether its good effects are dependent on its action on the stomach, or on the tissues after its absorption into the blood. Quinia has been recommended in passive bleeding, in undue suppuration, profuse menstruation, spermatorrhœa, and in excessive secretion of milk.

Quinia appears to be useful in some, but quite useless in other, cases of intermittent hæmaturia.

Quinia is found in the blood, which dissolves more of it than water; in the saliva, bronchial mucus, milk, and in dropsical effusions. It is said to be eliminated slightly with the sweat; but Briquet, after giving large doses, could detect none in this excretion.

Both quinia and cinchonia pass off in part by the urine, but a portion appears to be consumed in the blood, or to be eliminated in some other way. Kerner says that "a respiratory power of 3,000 c.c. can destroy fifteen grains of sulphate of quinia in twenty-four hours; any amount over this will pass into the urine." Quinia appears in the urine of healthy individuals in the course of two to five hours, but more quickly in young than in old persons. In some diseases (intermittents, pulmonary, emphysema, pneumonia, morbus Brightii) its exit is much delayed, and in three cases in which large doses were given, Dietl detected it in the urine many weeks after the last dose, which shows that it is not easily destroyed in the body.

Dr. Ranke has made the important observation, that a scruple of disulphate of quinia lessens by one half the excretion or the formation of uric acid, the effect continuing about two days after a single large dose, the other constituents of the urine remaining unaffected. It would seem likely that the uric acid is not simply retained in the system; for as in Ranke's cases no subsequent increased excretion took place after the effect of the quinia had gone off, its formation was absolutely lessened, or it must have been converted into some other substance. (Parkes on Urine.)

Certain circumstances modify the operation of the salts of quinia. The physiological symptoms appear early in young people who can resist the toxical action of the drug; but, on the other hand, the effects of quinia are more marked in old people. Diffusible stimulants, as wine and coffee, are said to counteract the action of quinia.

It has been asserted that quinia given to a healthy person will produce fever.

CALUMBA.

CALUMBA is used as a tonic to increase appetite and digestion. Like most bitters, it exerts a slight irritant action on the stomach, and owing to this property it is said to obviate slight changes in the mucous coat of the stomach, and in this indirect way to assist appetite and digestion. Being easily tolerated, it is employed when the stomach is weak, as in convalescence from an acute disease, when it is often found that calumba is borne with benefit, while stronger tonics upset this organ.

GENTIAN.

Gentian is used for the same purposes as calumba, but is reputed to be slightly purgative.

Mixed with infusion of senna, it is useful when a tonic and purgative are required.

QUASSIA.

Quassia is poisonous to some of the lower animals, as flies, and other insects.

Like the preceding substances, it is a tonic. It has been used in intermittent fever.

Infusion of quassia is a very useful injection in ascarides. It is efficacious also when administered by the mouth.

CHAMOMILE.

These flowers contain both a volatile oil and a bitter substance, and thus to some extent combine the properties of bitters with those of ethereal oils.

They are not often used as tonics, but an infusion is sometimes employed to assist the action of emetics.

In the common summer diarrhœa of children, often occurring during teething, characterized by green, many-coloured, and slimy stools, the infusion often proves very useful, in doses of half a drachm or a drachm This medicine is likewise efficient in other kinds of summer diarrhœa.

It has been used in intermittent fever, in neuralgia of the fifth nerve, and to prevent the returns of "sick headache."

CHIRETTA.

Chiretta is a tonic. When given to promote appetite, it should be taken, like other bitters, a short time before food, as their effects soon wear off.

CASCARILLA.

Cascarilla has a warm, agreeable, bitter taste, and is a stimulant as well as tonic. It may be used as the preceding medicines to promote appetite.

It has been used in intermittent fever and in dysentery.

ORANGE-PEEL.

Orange-peel contains both a bitter principle and much volatile oil, thus combining the properties of bitter substances with those of the ethereal oils.

ELATERIUM.

This drug has a very bitter taste, and excites a free secretion of saliva.

It is a powerful drastic hydrogogue cathartic. It often produces colic, and not unfrequently vomiting. In large doses it may excite inflammation of the stomach and intestines, and even of the peritoneum. It is given as a purgative, especially in dropsies; by carrying off a large quantity of water, it is hoped that the dropsy may be reduced. It is thus used both in ascites, and in the dropsy from kidney or heart disease. It must be borne in mind that free purging is very exhausting, and that elaterium very often disorders the stomach, and spoils the appetite. It is a medicine which must be given with caution.

Dr. Hyde Salter strongly recommends purgatives in dropsy depending on aortic, obstructive, or regurgitant disease. He says that although we cannot alter the heart, we can lessen the quantity of blood it has to propel, and thus diminish the congestions on which the dropsy depends. He employs elaterium, and advises a small dose at first, say one-sixth of a grain, to be given alternate mornings at about five a.m., so that by ten or eleven the purgation has usually ceased. This treatment, he says, quiets the heart, relieves the dyspnœa, lessens the pulmonary congestion, and thus diminishes the hydrothorax.

COLOCYNTH.

This drug has an intensely bitter taste, and occasions an abundant secretion of saliva.

It produces diarrhœa, colic, and sometimes vomiting. The diarrhœa is watery, and, after large doses, serous, mucous, and bloody. In large doses it may excite gastro-enteritis and peritonitis.

It is chiefly used as a purgative, but almost always in combination with other substances. In obstinate constipation it is a good plan to employ a few drops of the Prussian tincture several times a day.

It has been used as a drastic cathartic in dropsies, and, like most other powerful purgatives, it has been used for worms; but it has no direct poisonous influence on them, but merely expels them mechanically. Purgatives, therefore, are not good anthelmintics.

ALOES.

Aloes has been used as a slight stimulant to wounds, and when thus employed it often purges. "Dr. Gerhard, of Philadelphia, found it the medicine best adapted for endermic uses, as its application does not irritate a blistered surface very powerfully. Ten grains of it thus employed produced five or six stools, which were generally accompanied with griping. Infants are purged by the milk of nurses who have taken aloes." (Stillé.)

It is reputed to be a tonic, and to increase the secretion of bile.

It is chiefly employed as a purgative. It acts mainly on the large intestine and rectum. Its action is slow, and six, twelve, or even twenty-four hours may elapse before it operates. It produces bulky motions, a little softened, but not watery. It evidently acts but little on the mucous membrane of the intestines, and is merely an evacuant of fæces. It often occasions slight griping, and sometimes tenesmus. As its action is tardy, it is injudicious to combine it with more speedy purgatives. It is well suited for cases of chronic constipation; for the habitual use of it does not lessen its activity, and it is even said that the dose may be gradually decreased. Sulphate of iron is said to heighten its action.

When both a tonic and a purgative are required, aloes, like senna, may be usefully mixed with some bitter, as gentian. When combined with tonics, purgatives, it is said, act in smaller quantities.

Aloes in a variety of combinations is in common use as a laxative in habitual dyspepsia, with constipation. The compound decoction of aloes, formerly called baume de vie, is a serviceable after-dinner laxative. The basis of many dinner pills is one grain of watery extract of aloes. A dinner pill containing one grain of watery extract of aloes combined either with extract of nux vomica, extract of gentian, or extract of cinchona, is very useful.

In habitual constipation, aloes is the best and the most commonly employed purgative. Dr. Spender, of Bath, extols the following pill, taken at first three times, then twice, and afterwards once a day: one grain of watery extract of aloes, and two grains of sulphate of iron. This pill takes some days to act. Aloes has been accused of producing piles, and in full or over-dose will no doubt aggravate this disease; but most authorities are inclined to attribute piles to the constipation aloes is employed to remove, and not to the aloes itself. Indeed, the author is convinced that in many cases moderate doses of aloes, just sufficient to gently relieve the bowels, are highly useful in piles.

By its action on the rectum aloes sympathetically affects the neighbouring pelvic organs, as the uterus; and, given at, and just before, the menstrual period, is useful in many cases of amenorrhœa and deficient menstruation. We cannot refrain from citing the admirable remarks of Dr. Graves on amenorrhœa and its treatment. "The periodicity of this function," he says, "can still be traced, even in cases where suppression has continued for a great length of time, by means of the menstrual molimina (pains in the loins, thighs, and hypogastric region, flushings, colicky pains of the abdomen, general feeling of *malaise*), which occur at stated intervals; in endeavouring to bring on the discharge, therefore, we must be guided as to the time the attempt should be made, by an observance of the period at which these molimina occur. For a few days before that time our efforts to produce a determination of blood to the uterus may be judiciously employed; and if they fail, the attempt should be abandoned until a few days before the next menstrual period. Of course, I speak not here of the general constitutional treatment, for this must be constantly persevered in; one of the chief means of bringing back this evacuation being the restoration of health to the natural standard. In some this is to be effected by a tonic, and in others by an opposite mode of treatment.

" . . . What I wish to impress on your minds is, that all those remedies, as pediluvia, stuping of the genitals, leeches to the inside of the thighs, near the labia, aloes, and other stimulating purgatives, etc., should be only used at the times already spoken of. To use them at any other period, either after the molimina have disappeared, or during the intervals between them, tends, in most cases, still further to derange nature, by determining to the uterus at an unseasonable time, when there is no natural tendency to that organ. Under such circumstances the very same means will frequently fail, and prove injurious, which, applied so as to coincide with the time of the natural effort, would have been successful. To illustrate these principles by an example: We are consulted in the case of a young woman affected with various hysterical symptoms for several months, and during that period more than usually subject to headache, languor, loss of spirits, diminution of appetite, and irregularity, and usually constipation of bowels; she is pale, and complains of various pains and uneasy sensations, and has not menstruated since the accession of these symptoms. Here it is evident that the constitutional treatment must be strengthening and tonic. The practitioner will therefore recommend regular hours, much gestation in the open air, a nutritious diet, and afterwards cold shower-baths; he will regulate the bowels, and afterwards prescribe a course of tonic medicines, chalybeates, preparations of bark, strychnia, etc.; he will likewise inquire carefully when the last period happened, and when, and how often since that occurrence, menstrual molimina were observed. He thus ascertains when they should again recur, and contents himself with enforcing the constitutional treatment until about six days before the calculated time. Then he lays aside the other medicines, and has recourse to those means which determine to the uterus. Two leeches are applied to the inside of the thigh, near the labium, every second night, until they have been three times applied.* The bleeding is encouraged by stuping. On the intermediate days the bowels must be actively moved by aloetic pills; and for three nights before and after the molimina, hot pediluvia, rendered stimulating by mustard seed, may be used. During the same time also frictions, with stimulating liniments, should be applied to the feet and legs every morning, and oil of turpentine or tincture of cantharides may be exhibited internally, while the necessity of more active exercise is inculcated. If these means fail, they must for the moment be laid aside, and the constitutional treatment must be again resumed until the same number of days before the next period, when the list of remedies above spoken of must be again tried, and in few cases indeed shall we find them to fail."—*Graves' Clinical Lectures.*

SQUILL.

Squill has a bitter taste. It acts powerfully on the stomach and intestines in full doses, exciting great nausea and vomiting, with frequent watery and even bloody diarrhœa. Similar symptoms are likewise produced when the drug is injected into the cellular tissue or peritoneal cavity.

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* The author has never found it necessary to have recourse to bleeding.

Squill is never used as an emetic or purgative, but almost exclusively as an expectorant in bronchitis.

Some praise it highly as a diuretic. It is recommended in all forms of dropsy.

JALAP.
SCAMMONY.

Buchheim asserts that these two substances are rendered purgative only by the addition of the bile; unmixed with this secretion, they are inert. They are easily soluble in the bile, and probably undergo decomposition, and the products are unknown. Taurin and glycocoll exert no influence on their efficacy, but it is otherwise with tauro-cholate and glyco-cholate of soda; hence Buchheim concludes that the activity of these drugs is determined by the soda of the bile. They excite diarrhœa of watery motions, with some colic and occasional vomiting. Their use is often followed by much constipation.

These medicines are used as purgatives in obstinate constipation; and jalap, in combination with other substances, is employed in dropsies. Scammony is frequently used with much advantage to destroy the small thread-worms infesting the rectum.

RHUBARB.

Rhubarb is used as a purgative. It is asserted to be also a tonic. After purging, it constipates the bowels, on which account it is often used in the early stages of diarrhœa, to get rid of any irritating matters from the intestines, and after their expulsion to check the diarrhœa. It is a very useful purgative in children's cases, especially when mixed with two or three times its weight of bicarbonate of soda.

Dr. Stillé, of Philadelphia, on the authority of Dr. S. Jackson (U.S.), whose testimony he endorses, speaks of rhubarb as a remedy of surprising efficacy in piles, when laxatives are needed. He directs a piece weighing about ten grains to be chewed, or rather slowly dissolved in the mouth nightly, or less frequently, according to the degree of constipation. He estimates that rhubarb taken in this fashion is fivefold more efficacious than the powder. He also recommends it in the costiveness and the hæmorrhoidal swellings incident to pregnancy. (Stillé: Therapeutics.)

Rhubarb generally colours the urine reddish yellow, which, on the addition of ammonia and other alkalies, changes into a purple red. It colours also the sweat, the serum of the blood, and the milk. It makes the milk bitter and purgative.

It may be usefully mixed with some tonic.

SENNA.

SENNA is an active purgative, increasing both secretion and peristaltic action. It often produces both nausea and griping. It may be usefully combined with a bitter tonic, as in the mistura gentianæ composita of former pharmacopœias. This contains an ounce of compound infusion of gentian to half an ounce of compound infusion of senna, and is a very useful compound in dyspepsia with constipation.

Senna renders a mother's milk purgative, and may produce colic in the child.

SENEGA.

SENEGA increases the secretion of the bronchial mucous membrane, and probably that of the other mucous membranes. It produces a burning itching sensation in the mouth and throat.

It is used in chronic bronchitis, especially in the case of aged people, in whom this disease is usually complicated with emphysema. Some give it in croup and whooping-cough. It is also reputed to be diuretic, and is used when the deficiency of urine is owing to kidney disease. "Infusion of senega (four to six drachms infused in six to twelve ounces of water, and taken during the day) produced no effect on the urine in Böcker's experiments, conducted on himself and on a pregnant woman." (Parkes on Urine.)

Anthelmintic Medicines—

- **FILIX MAS.**
- **KOUSSO.**
- **KAMELA.**
- **SANTONIN.**
- **TURPENTINE.**
- **ARECA NUT.**
- **BARK OF THE POMEGRANATE ROOT.**
- **POWDERED TIN.**
- **MUCUNA, etc.**

The intestines may be infested by worms of different kinds. The common kinds are the flat worms (Tænia solium and Bothriocephalus latus), round worms (Ascaris lumbricoides), and thread worms (Ascaris vermicularis). These may be treated in three ways. Drugs, as powdered tin and mucuna, may be employed to kill the worm by their mechanical action, or powerful purgatives may be used simply to expel the worm, as jalap, scammony, etc.; or true vermicides, having very little effect on the tissues of the human body, to poison and kill the worm. With the exception of powdered tin and mucuna, all the medicines comprised in the foregoing group are vermicides. It must, however, be borne in mind that all are not equally efficacious for every kind of worm, but that some are poisonous to one kind, and harmless to another; success will depend, not only on giving the fitting drug, but giving it in the right way. These medicines should reach the worms in as concentrated a state as possible; if the stomach and intestines are filled with food, the poison being thus diluted, may fail to destroy the worms. It is proper, therefore, to give over-night a purgative, and to direct the patient to take a very light tea and no supper. On the following morning, after the purgative action, give the anthelmintic medicine.

Filix Mas is employed for tape-worm. Kuchenmeister asserts that it is more poisonous to the bothriocephalus than to the tæniæ. Before taking this medicine the patient should eat a very light tea, no supper, and, just before bedtime, swallow a dose of castor oil, a purgative to be preferred to others on account of its speedy action. On the following morning, at about six or seven o'clock, when the oil will generally have acted, give the liquid extract of male fern, in a dose varying from ten drops to a drachm, according to age. The patient is then to abstain from food till the bowels have been freely relieved, when in most cases the worm will be expelled. Some recommend a brisk purge to follow the anthelmintic; but this is seldom necessary, as the foregoing simple plan rarely fails to dislodge the worm. Too large a dose of the male fern may cause nausea, sickness, and even colic, effects seldom witnessed if only a moderate quantity is employed. The liquid extract of male fern is slightly purgative, and for this reason it is not often necessary to administer a purgative after it. The worm should be carefully examined, in order to ascertain if the head has been expelled; in that case there is no fear of the regrowth of the worm. It has, however, been ascertained, that if only the head and a small piece of the neck are left, the worm will die; so that if the head cannot be discovered, it must not be concluded that the patient is not permanently freed of the worm. If any piece is found which tapers to a fine point, even if the head is not attached, it may reasonably be hoped that the worm is destroyed. A good plan to obtain for examination all the worm which has been expelled, is to shake up the motions, already watery and loose from the purgative, with some water, and to filter the whole through a coarse piece of muslin. By this means, even if the head is separated from the trunk, it may be detected and examined.

The treatment for the flat worm by male fern is generally considered the best.

Kousso is used for tape-worms of all kinds, and appears to be very successful, although not much employed in this country. In Abyssinia, where tape-worm is extremely common, kousso has been in use upwards of two centuries. The dose is half an ounce of the flowers suspended in water, and the patient must have fasted for a short time, as in the previous case. Kuchenmeister asserts that kousso expels the worm slowly and in pieces, and that it rarely expels the head. It may cause slight nausea and even vomiting. Its action on the bowels being very slight, it is customary to follow it by a mild purgative.

PUNICA GRANATUM.—The bark of this root is used. It is employed chiefly in India for tape-worm. Neligan directs the maceration of two ounces of bruised bark, of fresh root if possible, for twenty-four hours in two pints of water, then boil down to one half, strain, and divide into three doses, which are to be taken at half-hour intervals. Vomiting often occurs, which, however, should not prevent the giving of the three doses. This treatment should be occasionally repeated daily for four or five days. Most practitioners find the dried root inert.

SANTONIN is the active principle of worm seed. It is very efficacious for round and thread worms, but is inoperative against tape-worms. In the treatment both of round and thread worms, two or four grains, according to age, are to be mixed with a drachm or more of castor oil, and taken early in the morning before breakfast, repeating the dose two or three mornings successively. Such treatment seldom fails to bring away any round or thread worms. Santonin has been used, mixed with castor oil, as an injection into the rectum for thread-worms; and Kuchenmeister found that santonin in castor oil, mixed with albumen, killed ascarides in ten minutes, while without the oil the santonin had no effect. He therefore recommends it to be given in two to five grain doses in an ounce of castor oil. This quantity is of course intended for adults. Santonin may be conveniently given in syrup, lozenge, or gingerbread. In an obstinate case, some advise the administration of one or two grains twice or three times a day; but, repeated so often, this medicine is very apt to occasion sickness and vomiting, together with great difficulty in holding the water; so that children, if they take much of this medicine, are apt to wet the bed at night, are constrained to pass water very frequently, and are even unable to hold it night or day.

After taking santonin, all objects sometimes appear of a green or yellow colour. The urine is coloured orange, and, on the addition of some solution of ammonia, it changes to a brilliant scarlet. It is curious that this remedy will sometimes stay the nocturnal incontinence of children, and when not dependent on the presence of worms, succeeds occasionally where other remedies, including even belladonna, have failed.

KAMELA is much used in India for tape-worm. It may be given in doses from 60 to 120 grains, in honey, syrup, or glycerine. It purges briskly.

ARECA NUT is much used by veterinarians to expel tape-worm from dogs, but may be employed for the same purpose in the human subject. Half or a whole nut is to be powdered, and mixed with some syrup, and swallowed. It sometimes succeeds when other remedies have failed.

TURPENTINE is praised by Neligan for its poisonous effectiveness over both the tape and round worm, but it is more deadly to the tape-worm. It is also efficacious as an injection against thread-worms. Kuchenmeister showed that it destroys tape-worm in an hour.

Thread-worms, which are found only in the rectum, are, as we have said, of all medicines to be swallowed, best removed by santonin. Scammony is effectual against thread-worms. A variety of substances administered by injections will speedily destroy thread-worms. Thus a tea-spoonful of common salt, infusion of quassia, or a drachm of sesquichloride of iron, in a pint of water, will be found very effectual; so will lime-water, solutions of alum, and, in fact, any substance which will coagulate the albumen of their bodies.

In the treatment of worms it must always be remembered that the mucous membrane is generally in an unhealthy state, secreting much tenacious mucus, which forms a favouring nidus for the development of worms; worms will rarely develop in a healthy state of the digestive canal. The foregoing modes of treatment are therefore only temporarily remedial, and after the expulsion of the worms, the morbid condition of the intestinal mucous membrane must be treated. This condition of the intestines is generally seen in unhealthy, anæmic children. Cod-liver oil and iron preparations soon restore the gastro-intestinal canal to a healthy condition. Oils, as is well known, are reputed to destroy worms. If these remedies fail, other medicines must be employed which will remove the catarrhal state of the mucous membrane, as common salt, chloride of ammonium, and antimony salts. Cold-sponging, outdoor exercise, and a judicious diet aid in improving the general health.

ON POULTICES AND HOT FOMENTATIONS.

THESE widely used applications afford warmth and moisture to diseased parts.

They are applied to the skin when the surface or the structures beneath it are inflamed. By their warmth and moisture they relax the tissues, and so remove in some degree the tension due to inflammation, and by this means ease pain; if applied to inflamed tissues, as to abscesses, inflamed pimples, and the like, at the very beginning of their development, they often summarily check the inflammation and prevent the formation of pus. Fomentations with water as hot as can be borne are also very efficacious in arresting inflammation and checking the formation of matter, and should be generally employed as adjuncts to the poultices. Hot fomentations will often disperse or restrict the development of acne indurata and similar inflamed pimples apt to appear on the face.

These applications are of further use when suppuration has set in, and when matter requires to be removed. Poultices greatly facilitate the passage of the matter to the surface and its expulsion, while at the same time they considerably limit the spread of the inflammation in all directions. Here, again, very hot fomentations often repeated, and continued for some time, are a useful supplement to poultices.

It is necessary to remember that a great deal depends on the heat of the application. Poultices should be always applied as hot as can be borne, and frequently changed, lest they become cold and hard. Indeed, they can scarcely be changed too often; but in hospital practice it is impossible to do this very frequently; yet even in such institutions, where the supply of nurses is necessarily limited, poultices should be changed every two or at most three hours.

When applied to disperse inflammation or to hasten the maturation of abscesses, the poultice should be large, reaching beyond the limit of the inflamed tissues; but as soon as the abscess or boil has maturated and burst, the poultice should be very little larger than the opening in the skin through which matter is escaping. If a large poultice is applied over-long to the skin, it soddens and irritates it, and is very liable to produce an eruption of eczema, or to develop fresh boils around the one first formed.

Poultices are not only soothing to inflamed tissues when in direct contact with them, but they appear to act in the same manner on deep-seated parts when placed on the surface over the inflamed or painful organ. They are of great service in pneumonia, pleurisy, bronchitis, pericarditis, peritonitis, etc. In such cases a poultice should cover a considerable extent of surface. Here again, acting by virtue of their warmth and moisture, they should be applied very hot, and removed as soon as they become cool. To avoid exposure of the warm, moist skin, the old poultice should not be removed till the new one is ready to replace it.

When an abscess has fully developed, and is ready to be opened, it is far better to treat it by Lister's carbolic-acid method than by poultices.

In skin diseases, as eczema,' etc., when the skin is highly inflamed, painful, red, and swollen, these conditions may be much moderated and the pain alleviated by poultices.

In treating boils, it is a good plan, in order to protect the adjacent tissues from the undue action of the poultice, so as to check the production of fresh boils, to cover the boil with a piece of opium plaster with a circular hole, and only to apply the poultice over the plaster.

These applications are extremely useful to children, who, when attacked with bronchitis, or broncho-pneumonia, or lobular pneumonia, should have the entire chest enveloped in a jacket-poultice. As young children are apt to be restless, and to toss about in bed, the poultice soon becomes rucked up, and converted into a narrow band encircling only a very limited portion of the chest, and the uncovered part of the chest, and much of the moist bread or meal, is exposed, and becomes cold. The jacket-poultice should be constructed in the following way. To a piece of linen sufficiently large to go quite round the chest, tapes should be sewn in such a manner that they can be tied in front of the chest, and over each shoulder. It is as well to have the tapes sufficiently numerous to admit of three fastenings down the front of the chest. That the poultice may retain its heat, one of two plans may be adopted: either the material should be spread an inch or more thick, or it may be made thinner, and then coated entirely with a layer of cotton-wool. This latter plan is preferable; for, being lighter, it does not hamper the breathing—a matter of importance, especially with children.

In inflammation of other deep-seated organs besides those of the chest, the same methods, modified to suit the part, should be adopted. In peritonitis it is of great importance that the poultice should be spread thin, and covered with a layer of cotton-wool; for if heavy it aggravates the pain.

Poulticing is useful in acute rheumatism, lumbago, sciatica, pleurodynia, myalgia, and in those so-called rheumatic pains which often attack limited parts of the body, as one arm, etc.* They are soothing and pleasant to the inflamed joints in rheumatic fever, although cotton-wool is generally sufficient. In acute lumbago, poulticing often brings speedy relief, the severest cases being greatly benefited in a few hours, and generally cured in one or two days. The poultice must be very hot, and large enough to cover the whole loins or part affected, and thick enough to remain quite hot for half an hour, when it must be changed for a fresh one. This treatment should be continued for three hours, or longer, if unrelieved; when it is discontinued, the skin must be covered with a piece of flannel, and the flannel covered with oil-silk; this after-treatment, like that of the poultices, promotes free perspiration, upon which mainly depends the efficacy of this plan.

Sciatica may be treated in the same way, but the result is not often so satisfactory. (*Vide* Ether.)

Poultices employed as for lumbago, and followed by the application of lint and oilskin, are often useful in severe forms of pleurodynia and myalgia. Belladonna liniment is usually sufficient, and even preferable, in pleurodynia; and sometimes the ether spray at once and permanently removes the pain of this annoying affection.

As we have said, poultices may be constructed of various materials. Those used for the purposes just described may be made of linseed-meal, oatmeal, bread, or starch. Each has its peculiar characters, and differs somewhat from the others. Linseed-meal and oatmeal poultices have most properties in common; they make compact and only slightly porous poultices, retaining heat and moisture longer than other kinds, and are consequently often to be preferred to bread or starch. But linseed contains a not inconsiderable quantity of acrid matter which sometimes irritates, especially if the skin be of a fine and delicate texture, or when it is inflamed with some eruption, in which case oatmeal or bread must be substituted. Bread poultices are more porous and blander than those of linseed-meal, but the porosity depends very greatly on the way of making them. Bread poultices cool more quickly, and give less moisture to the skin, than those made of linseed-meal. Starch poultices retain their heat for a considerable time, and are very bland, unirritating applications.

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* Galvanism proves highly useful in some forms of these complaints, especially in lumbago. In sciatica if the affected nerve is pretty strongly galvanized, it gives at least temporary relief, and in some cases a few applications effect a cure. The sciatica and deep-seated pains about the shafts of the long bones, even the dull aching pain in the joints, which not unfrequently remain after an attack of acute rheumatism, will often yield to galvanism.

It is as well to mention that linseed-meal poultices are more tenacious than those made of bread, and are therefore less liable to break up and fall about the bed and clothes of the patient, rendering him unclean and uncomfortable.

In making a poultice, care should be taken that all the materials, as boiling water, linseed-meal, linen, strapping, bandages or tapes, wool and oil-silk, are close at hand ready for use, and placed before a good fire to warm them thoroughly. To manufacture a linseed poultice, sufficient boiling water is to be poured into a heated bowl, and into the bowl the meal must be quickly sprinkled with one hand, while with the other the mixture is constantly stirred with a knife or spatula, till sufficient meal has been added to make a thin and smooth dough. This should be done as rapidly as possible, otherwise the poultice when it is made will be almost cold. Only an experienced hand can make a model poultice. By adding the meal to the water, with constant stirring, instead of the water to the meal, a thorough blending of the two ingredients is insured, not a knotty, lumpy, uncomfortable mass, too often vexing instead of soothing the patient. The dough must then be spread quickly and evenly on the warm linen, already cut of proper size and shape, the edges of the linen turned a little way over the meal, to prevent any portion escaping beyond the linen, and soiling the patient's clothes.

There are two methods of making bread poultices. One way is to cut the bread in thickish slices, put it into a basin, pour some boiling water over it, and place the soaking mass by the fire for five minutes; then pour off the water, replacing it with fresh boiling water, and repeat this process; afterwards pour off the excess of water, and press the bread, beat up with a fork, and make into a poultice. The other plan is to cut stale bread into thick slices, and pour enough boiling water over it to cover it; place the whole by the fire, and allow it to simmer for a short time, then strain off the excess of water, and prepare the poultice. The first-described plan makes a porous poultice, the other a more compact poultice, sharing the character of one made of linseed meal. Each, as we shall see, has its application in disease.

Bran poultices are useful on account of their lightness.

Starch poultices are entirely unirritating, and retain their heat for a considerable time. The way to proceed is to add a little cold water to the starch, and to blend the two into a pap; then add sufficient boiling water to make a poultice of the required consistence, which must be spread on linen in the manner already described. Poultices made of this substance are useful as soothing applications to open cancers, and to skin eruptions when there is much inflammation, heat, and pain.

There are several ways of employing charcoal as a poultice. It is used to prevent disagreeable odours from foul sores, and it is thought also to conduce to a healthy condition of the tissues. When employed for this double purpose, the charcoal is mixed with the constituent of the poultice. As a porous poultice is here required, bread is better for this purpose than linseed-meal. A portion of the charcoal should be uniformly mixed with the bread, but the greater part should be sprinkled over the surface of the poultice. Whether a charcoal poultice is greatly superior to one made of simple bread is perhaps doubtful; for the charcoal must soon cease to absorb gases, and thus lose its deodorizing property. It may perhaps promote a healthier condition in the sore. If the object is merely to prevent disagreeable smells, and to keep the air of the room pure and sweet, the plan pointed out in the section on charcoal is far preferable.

It is a good practice to sprinkle dry charcoal thickly over foul, sloughing, putrid sores, and to cover the charcoal with a simple poultice. This treatment appears to hasten the separation of sloughs, and to promote a healthier state of the tissues. This plan may be applied to a boil when the core is separating, or to a bed-sore while the black slough still adheres to the living tissues.

Some maintain that yeast poultices are useful applications to sloughing sores, preventing destruction of the tissues, and promoting the separation of sloughs. Yeast poultices are made in two ways. In one the yeast and water are added to flour till ordinary dough is made, and the dough is applied while fermentation is going on. In this case it is simply an application of "rising dough." The other way is to smear warmed yeast over the surface of a simple bread poultice.

A carrot poultice is made by boiling carrots till they become quite soft, mashing them with a fork, and spreading the pulp on linen in the ordinary way. This application is supposed to make wounds cleaner and healthier.

Laudanum is sometimes added to poultices to ease pain, and when the skin is broken it is effectual in this respect.

Solutions of chloride of lime or of soda may be added to poultices to destroy offensive gases given off from unhealthy sores.

In eczema, with much inflammation and sensation of heat, Dr. McCall Anderson recommends a cold potato poultice sprinkled with a small quantity of absorbent powder, containing camphor. The powder is composed of half a drachm of camphor, reduced to powder, with rectified spirit, and three drachms each of powdered talc and oxide of zinc. This is a useful dusting powder without the poultice.

Professor Marshall employs an iodide of starch as an application to clean sloughing sores. It is made with two ounces of starch mixed with six ounces of boiling water, which forms a jelly, and should be added before it cools to half an ounce of liquor iodi. This poultice is spread on lint, and applied cold.

Fomentations by means of flannel wrung out in boiling water are employed for similar purposes as poultices. They are used for the sake of their moisture, but especially for their warmth, and they differ from poultices in being less weighty, and therefore less likely to increase the pain of very tender parts. The flannel is wrung out by means of a wringer made of stout towelling attached to two rods. The wet flannel is placed in the wringer, which is then twisted round the flannel very strongly, till as much as possible of the water is pressed away. As the flannel when first removed from the boiling water is too hot to be held by the hands, the wringer is very handy and useful. If wrung as dry as possible, these fomentations may be used very hot, without fear of scalding and blistering the skin.

When the fomentation is placed on the body, it should be covered with a piece of mackintosh, and tied on with bandages. Hot fomentations, being used chiefly for the sake of their heat, and quickly cooling, must be frequently renewed; and when removed, the skin must be carefully wiped dry, and the part covered with a piece of flannel, to prevent the patient taking cold.

Fomentations, and in a less degree poultices, are very useful to relax spasm in the internal organs, as in intestinal, renal, and biliary colic. When the inflammation is very extensive, fomentations are preferable, as a poultice of large dimensions would be heavy and uncomfortable. Thus, fomentations are employed when a limb is extensively affected with erysipelas, or when the tissues have been widely contused, and have become inflamed.

If twenty or thirty drops of turpentine are sprinkled on a hot fomentation of the above description, we obtain a good counter-irritant, useful when we require a stimulating, combined with a warm soothing, action.

Sometimes it is desired to apply heat to a part of the surface of the body, but at the same time it is important to avoid the relaxation of the tissues which moisture would produce. In such cases dry strongly heated applications are used. These may be made of various substances. Flannel, strongly heated before the fire or in an oven, is sometimes employed; but it very speedily loses its heat, and becomes useless. It is therefore customary to employ substances which retain heat, as sand or chamomile flowers. They are to be strongly heated over the fire on an iron.

pan, and then to be run into a previously heated linen bag made for the purpose, of such a shape and construction that the sand or chamomile flowers shall form a thickish and even layer. Each substance possesses its respective advantages; the sand, though heavy, better retains the heat, while the chamomile flowers are light, but sooner lose their warmth. A thin piece of flat tile, heated in the oven, and wrapped in flannel, is lighter than sand, retains its heat for a considerable time, and is very generally to be procured. These applications are of great service in relieving spasm and its accompanying pain.

ON ENEMATA.

Injections are used for a variety of purposes; to procure evacuation of the bowels, to restrain diarrhœa, to ease pain about the region of the pelvis, to destroy worms, to introduce medicines into the general system, and lastly, to introduce nutritive substances into the rectum in cases where food cannot be taken by the stomach.

In the administration of enemata for each of these purposes, certain points must be attended to.

First, concerning injections used to relieve the bowels. It must be clearly understood that enemata seldom act by merely washing away the fæces from the intestines; for they act efficiently when the fæcal matter is lodged high up the intestines, as the transverse colon or cæcum. They act by stimulating, probably, the whole intestinal tract to more vigorous peristaltic action, by which means the contents are propelled along the canal, and finally expelled. This increased activity of the vermicular action of the intestines is produced, probably, by the injected fluid distending the lower part of the large gut, and so stimulating the intestines far beyond the point to which the injection reaches, causing the expulsion of their contents. The object therefore is to distend the rectum and the adjoining part of the intestine. Now an enema constantly fails, owing to the introduction of so little fluid, that it excites scarcely any contraction. A large quantity, as two, three, or even four pints, of fluid should be introduced. He, however, who attempts for the first time, and without due observance of certain conditions, to introduce a copious injection into the rectum, would be doomed to disappointment.

When a copious injection is to be given, the fluid must be slowly pumped into the rectum, when, after a variable, but usually a short time, the patient complains of inability to retain more, and suffers from more or less severe colicky pain in the belly, and an urgent desire to empty the bowels. The pumping must now be intermitted for a while, and the patient directed to prevent the escape of the fluid; but if he is unable to control the sphincter, the administrator must help him. This can be done in several ways, all having for their object the strengthening the contraction of the sphincter. The simplest plan, but not always the most successful, is to support firmly with the hand the perinæum and structures around the anus, either with the bare hand, or with the aid of a folded towel. Should this simple support prove ineffectual, which is often the case after a considerable quantity of fluid has been introduced, further assistance is afforded by passing into the rectum, alongside the nozzle of the enema-pipe, one, two, or even three fingers, as circumstances may require, and to press them with the nozzle strongly upward. Stimulated in this way, the sphincter firmly grasps the fingers, and effectually prevents the escape of the fluid. Indeed, with these precautions, almost any amount of fluid may be pumped into the intestines. From time to time the patient will complain of griping pains in the stomach, and an oppressive desire to go to stool, when the pumping should be stayed a while, and recommenced as soon as these symptoms pass away. The operation over, the patient must be directed to lie quite quiet on the left side, and, if possible, to retain the fluid for ten minutes or more, so as to ensure a more active and thorough contraction of the bowels.

It need scarcely be mentioned that if the rectum or lower part of the large intestine is the seat of cancer, or is diseased in other ways, copious injections, and the introduction of a long tube, are attended with danger.

Sometimes the rectum and lower part of the gut is distension with fæces, against which the injected fluid juts, and finding no passage it of necessity flows back through the sphincter as fast as it is pumped in. One of two ways may be adopted to force such a blockade. A hollow tube of some inches in length is passed through the impacted fæces, till its free extremity reaches the sigmoid flexure, or even higher. If it is made to pass through the accumulation in the intestine, the injection can easily be proceeded with. Should this fail, and it is highly urgent to obtain an evacuation, then two or three fingers, according to the yielding of the sphincter, are to be introduced into the rectum, and the fæces withdrawn, which can be easily accomplished if they are hard and firm. Obstinate constipation, such as we are now speaking of, occurs most commonly in diabetes. The hard and almost stone-like fæces can easily be withdrawn by the fingers in the manner described; and much more may be withdrawn than is contained in the rectum, for although the intestines may be unable to force the hardened fæces through the sphincter, they are quite capable of propelling them into the rectum; consequently, as fast as the fæces are withdrawn, fresh supplies are propelled downwards within easy reach of the fingers.

Various fluids are employed as enemata. Sometimes simple warm water or gruel is used. At other times, to one or other of these, soap, turpentine, or castor oil is added. The soap or gruel are generally employed when castor oil or turpentine is added to the injection, as they help to suspend these substances. It must be recollected that castor oil and turpentine are lighter than water, and will float on its surface. If the oil or turpentine is added to the fluid to be injected, although this may be well stirred, yet, as the injection proceeds, the oil rises to the surface; and as the tube of the syringe lies at the bottom of the vessel, the lower stratum of the fluid is first injected, while much of the oil or turpentine floats on the surface, or sticks to the sides of the vessel, while the portion which is ultimately injected operates only upon the rectum and the neighbouring intestine. The object should be to make the oil or the turpentine, as the case may be, rise as high up the canal as possible, so as to bathe and influence the mucous lining of the intestines as it ascends. The oil or turpentine well beaten up with three or four ounces of gruel, or soap and water, should be first injected into the rectum, after which the water is to be pumped in, so as to force the oil far up the intestinal canal.

What should be the temperature of an injection? Tepid fluid is generally used, but some consider that an injection acts more energetically on the tissues, and excites the intestines to more vigorous action, when the temperature of the fluid differs widely from that of the body. Thus cold or hot water may be used. Very cold water may be injected without the patient's cognizance of its temperature, or being at all incommoded by it.

It is unadvisable to habitually use warm evacuant enemata, or a torpid condition of the intestines may ensue, which will ultimately render the constipation worse.

Large quanties of water, as we have said, are employed to unload the bowels; but this is not the sole use of a free injection; for, if used comfortably warm, it is very soothing to the intestines and to the neighbouring organs. Thus the pain of cancer, either of the intestines or of the organs near may often be much mitigated by warm injections. And injections often greatly relieve the very distressing straining desire to evacuate, without any riddance of fæces, occurring in intestinal cancer. Warm injections are very soothing in the pain of cystitis, prostatitis, abscess of the prostate, and pelvic and abdominal pains generally. (*Vide* Opium and Belladonna.)

In some instances copious injections appear to prove beneficial in suppression of the urine.

Injections are often successful in restraining obstinate or dangerous diarrhœa. It is by no means necessary for the injection to reach that part of the intestines upon which the diarrhœa depends; for it is equally successful whether the mischief is situated in the small or large intestines. The benefit derived is therefore due to a close sympathy between the different parts of the intestines, by means of which an impression made on one part is communicated to another. When employed to restrain diarrhœa, it is well that the injection should be retained as long as possible, in order the more effectually to influence the intestines. Therefore small quantity should be injected, otherwise the intestine is stimulated to contract, and expel the enema. An injection of an ounce, or at most two ounces, is sufficient for an adult; and it may be repeated several times a day, according to the urgency of the diarrhœa.

The material used in such enemata is starch, of the consistence of cream, and at a temperature of 100°. An injection simply composed of starch proves effectual; but its astringent sedative action may be much heightened by the addition of some drops of laudanum, graduated in quantity according to the age and condition of the patient. The addition of some acetate of lead or sulphate of copper renders this injection still more astringent. These injections are invaluable in cases where delay is death. They will save many a life in the choleraic diarrhœa of children, which so rapidly proves fatal unless speedily restrained. The diarrhœa of typhoid fever, which, if excessive, adds extremely to the patient's danger, yields generally to these injections. The diarrhœa of phthisis is also generally amenable to these enemata.

Injections are also largely used to destroy thread-worms, which infest the rectum and the intestines in its immediate neighbourhood, but occur in no other part of the canal. As the object of the injection is to destroy these entozoa, a sufficient quantity of fluid should be employed so as to reach a little higher than the rectum. For an adult, half a pint is sufficient, and for a child of course less must be used. To the water injected various substances can be added, as common salt, tincture of sesquichloride of iron, lime-water, quassia, and various other similarly acting agents, with the object either of directly poisoning the worms, or of destroying them by coagulating the albuminous structures of their bodies. Injections are always successful in removing worms, and so affording temporary relief; but in the treatment of worms it must always be recollected that the morbid state of the mucous coat of the intestines, favouring the production of worms, must be remedied if a permanent relief is to be obtained.

Solutions too concentrated must not be injected, otherwise inflammation may occur, perhaps severe enough to cause sloughing in the rectum and margins of the anus. A tea-spoonful of salt, or a drachm of the tincture of steel, to half a pint of water, is sufficiently strong to effect the destruction of these delicately formed animals.

We have already spoken, in the various sections treating of each remedy, of the administration of medicines by enemata.

Nutritive enemata are employed in stricture of the œsophagus, or when swallowing is rendered impossible by tumours pressing against this tube, in persistent vomiting, and in painful diseases of the stomach, like chronic ulcer. A nutrient enema, in order to be retained, should not exceed three or four ounces, and should consist of bland, unirritating material, otherwise the lining membrane of the rectum becomes irritated and inflamed, a condition adverse to absorption. Mr. Marcus Beck advises the addition of pepsine and dilute hydrochloric acid to the injection. It sometimes happens that the rectum will not retain even four ounces, and this inability is more liable to occur after injections have been continued for some time. Before such enemata are given, it must be ascertained that the rectum is not filled with fæces.

Astringent and stimulating injections, composed of a pint of water, and containing ten to twenty grains of sulphate of copper, or corresponding quantities of nitrate of silver and sulphate of zinc, prove of great service in restraining the troublesome straining diarrhœa of chronic dysentery. In the earlier stages, too, of dysentery, large emollient enemata prove useful, especially by removing the fetid discharges, and soothing the inflamed mucous membrane.

POSOLOGICAL TABLE.

(From Dr. Garrod's *Materia Medica*.)

Absinthium (in powder)	20 gr. to 40 gr.
Acetum	1 fl. drm. to 2 fl. drm., diluted.
Acetum Scillæ	15 min. to 40 min.
Acidum Aceticum Dilutum	1 fl. drm. to 2 fl. drm., freely diluted.
Acidum Arseniosum	$\frac{1}{60}$ gr. $\frac{1}{24}$ gr. $\frac{1}{12}$ gr.
Acidum Benzoicum	10 gr. to 15 gr.
Acidum Carbolicum	1 gr. to 3 gr.
Acidum Citricum	10 gr. to 30 gr.
Acidum Gallicum	2 gr. to 10 gr. or more.
Acidum Hydrochloricum Dilutum	10 min. to 30 min., freely diluted.
Acidum Nitricum	1 min. to 5 min.
Acidum Hydrocianicum Dilutum	2 min. to 8 min.
Acidum Nitricum Dilutum	10 min. to 30 min.
Acidum Nitro-Hydrochloricum Dilutum	5 min. to 20 min., freely diluted.
Acidum Phosphoricum Dilutum	13 min. to 30 min., freely diluted.
Acidum Sulphuricum Dilutum	5 min. to 30 min.
Acidum Sulphuricum Aromaticum	5 min. to 30 min.
Acidum Sulphurosum	$\frac{1}{2}$ fl. drm. to 1 fl. drm.
Acidum Tannicum	2 gr. to 10 gr. or more.
Acidum Tartaricum	10 gr. to 30 gr.
Aconitum (leaves)	2 gr. to 10 gr.
Æther	20 min. to 60 min.
Aloe Barbadensis (in powder)	2 gr. to 6 gr.
Aloe Socotrina (in powder)	2 gr. to 6 gr.
Alumen (as an astringent)	10 gr. to 20 gr.
Alumen (as a purgative)	30 gr. to 60 gr.
Ammoniacum (the gum resin)	10 gr. to 20 gr.

Ammoniæ Benzoas	10 gr. to 20 gr.
Ammoniæ Bicarbonas	10 gr. to 30 gr.
Ammoniæ Carbonas (as a stimulant)	3 gr. to 10 gr.
Ammoniæ Carbonas (as an emetic)	30 gr. freely diluted.
Ammonii Chloridum	5 gr. to 30 gr.
Ammoniæ Phosphas	5 gr. to 20 gr.
Ammonii Bromidum	2 gr. to 20 gr.
Antimonii Oxidum	1 gr. to 4 gr.
Antimonium Nigrum	1 gr. to 5 gr.
Antimonium Tartaratum (as a diaphoretic expectorant)	$\frac{1}{16}$ gr. to $\frac{1}{6}$ gr.
Antimonium Tartaratum (as a vascular depressant or sedative)	$\frac{1}{6}$ gr. to 2 gr.
Antimonium Tartaratum (as an emetic)	1 gr. to 3 gr.
Aqua	ad libitum.
Aqua Anethi	1 fl. oz. to 2 fl. oz ; for infants, 1 fl. drm. to 2 fl. drm.
Aqua Camphoræ	1 fl. oz. to 2 fl. oz.
Aqua Carui	1 fl. oz. to 2 fl. oz.
Aqua Cinnamomi	1 fl. oz. to 2 fl. oz.
Aqua Floris Aurantii	1 fl. oz. to 2 fl. oz.
Aqua Fœniculi	1 fl. oz. to 2 fl. oz.
Aqua Laurocerasi	5 min. to 30 min.
Aqua Menthæ Piperitæ	1 fl. oz. to 2 fl. oz.
Aqua Menthæ Viridis	1 fl. oz. to 2 fl. oz.
Aqua Pimentæ	1 fl. oz. to 2 fl. oz.
Aqua Rosæ	1 fl. oz. to 2 fl. oz.
Aqua Sambuci	1 fl. oz. to 2 fl. oz.
Argenti Nitras	$\frac{1}{6}$ gr. to $\frac{1}{3}$ gr.
Argenti Oxidum	$\frac{1}{2}$ gr. to 2 gr.
Assafœtida (the gum resin)	5 gr. to 20 gr.
Auri et Sodii Chloridum	$\frac{1}{15}$ gr. and upwards.
Auri Terchloridum	$\frac{1}{20}$ gr. and upwards.
Auri Teroxidum	$\frac{1}{10}$ gr. and upwards.
Aurum (in powder)	$\frac{1}{4}$ gr. to 1 gr.
Balsamum Peruvianum	10 min. to 15 min.
Balsamum Tolutanum	10 gr. to 20 gr.
Barii Chloridum	$\frac{1}{2}$ gr. to 2 gr.
Beberiæ Sulphas	1 gr. to 20 gr.
Benzoinum (the balsam)	10 gr. to 30 gr.
Bismuthi Carbonas	5 gr. to 20 gr.
Bismuthi Subnitras	5 gr. to 20 gr.
Borax	5 gr. to 40 gr.
Bucco (powdered leaves)	20 gr. to 40 gr.

Calcii Chloridum	10 gr. to 20 gr.
Calcis Carbonas Precipitata	10 gr. to 60 gr.
Calcis Phosphas	10 gr. to 20 gr.
Calomelas (as a purgative)	2 gr. to 5 gr.
Calomelas (as an alterative)	½ gr. to 1 gr., frequently repeated.
Calumba (in powder)	10 gr. to 20 gr.
Cambogia (the powdered resin)	1 gr. to 4 gr.
Camphora	1 gr. to 10 gr.
Canella (in powder)	15 gr. to 30 gr.
Capsicum (in powder)	½ gr. to 1 gr.
Carbo Animalis Purificatus	20 gr. to 60 gr.
Carbo Animalis Purificatis (as an antidote)	½ oz. to 2 oz.
Carbo Ligni	20 gr. to 60 gr.
Cardamomum (powdered Cardamoms)	5 gr. to 20 gr.
Caryophyllum (cloves in powder)	5 gr. to 20 gr.
Cascarilla (powdered bark)	10 gr. to 30 gr.
Cassia (the prepared pulp)	120 gr. and upwards.
Castoreum (in substance)	5 gr. to 10 gr.
Catechu (in powder)	10 gr. to 30 gr.
Cerevisiæ Fermentum	½ oz. to 1 oz.
Cerii Oxalas	1 gr. to 2 gr.
Chloroformum	3 min. to 10 min.
Cinchona (the powdered bark)	10 gr. to 60 gr.
Cinchoniæ Hydrochloras	1 gr. to 10 gr.
Cinchoniæ Sulphas	1 gr. to 10 gr.
Cinchonidinæ Sulphas	1 gr. to 10 gr.
Cinnamomum (powdered bark)	10 gr. to 30 gr.
Colchicum (the powdered corm)	2 gr. to 8 gr.
Colocynth (the powdered pulp)	2 gr. to 8 gr.
Confectio Opii	5 gr. to 20 gr.
Confectio Piperis	60 gr. to 120 gr.
Confectio Rosæ Caninæ	60 gr. or more.
Confectio Rosæ Gallicæ	60 gr. or more.
Confectio Scammonii	10 gr. to 30 gr. or more.
Confectio Sennæ	60 gr. to 120 gr.
Confectio Sulphuris	60 gr. to 120 gr.
Confectio Terebinthinæ	60 gr. to 120 gr.
Conia Folia	2 gr. to 8 gr.
Copaiba	½ fl. drm. to 1 fl. drm.
Copaiba Oleum	5 min. to 20 min.
Coriandrum (the powdered fruit)	10 gr. to 30 gr.
Cortex Winteri	30 gr. to 60 gr.

Creosotum	1 min. to 3 min.
Creta Præparata	10 gr. to 60 gr.
Crocus (dried)	20 gr. upwards.
Cubeba (the powder)	30 gr. to 120 gr.
Cubebæ Oleum	5 min. to 20 min.
Cupri Sulphas (as an astringent or tonic	$\frac{1}{4}$ gr. to 2 gr.
Cupri Sulphas (as an emetic)	5 gr. to 10 gr.
Cusparia (in powder)	10 gr. to 40 gr.
Cusso	$\frac{1}{4}$ oz. to $\frac{1}{2}$ oz.
Decoctum Aloes Compositum	$\frac{1}{2}$ fl. oz. to 2 fl. oz.
Decoctum Cetrariæ	1 fl. oz. to 2 fl. oz.
Decoctum Chimaphilæ (*Lond.*, 1851)	1 fl. oz. to 2 fl. oz.
Decoctum Cinchonæ Flavæ.	1 fl. oz. to 2 fl. oz.
Decoctum Cydonii (*Lond.*, 1851)	1 fl. oz. to 4 fl. oz.
Decoctum Granati Radicis	1 fl. oz. to 2 fl. oz.
Decoctum Hæmatoxyli	1 fl. oz. to 2 fl. oz.
Decoctum Hordei	ad libitum.
Decoctum Pareiræ	1 fl. oz. to 2 fl. oz.
Decoctum Quercûs	1 fl. oz. to 2 fl. oz.
Decoctum Sarsæ	2 fl. oz. to 10 fl. oz.
Decoctum Sarsæ Compositum	2 fl. oz. to 10 fl. oz.
Decoctum Scoparii	2 fl. oz. to 4 fl. oz.
Decoctum Taraxaci	2 fl. oz. to 4 fl. oz.
Decoctum Tormentillæ (*Lond.*, 1851)	1 fl. oz. to 2 fl. oz.
Decoctum Ulmi	2 fl. oz. to 4 fl. oz.
Digitalinum	$\frac{1}{60}$ gr. to $\frac{1}{30}$ gr.
Digitalis Folia	$\frac{1}{2}$ gr. to $1\frac{1}{2}$ gr.
Elaterium	$\frac{1}{16}$ gr. to $\frac{1}{2}$ gr.
Ergota (the powdered ergot)	20 to 30 gr.
Essentia Anisi	10 min. to 20 min.
Essentia Menthæ Piperitæ	10 to 20 min.
Extractum Aconiti (from juice)	1 gr. to 2 gr.
Extractum Aloes Barbadensis	2 gr. to 6 gr.
Extractum Aloes Socotrinæ	2 gr. to 6 gr.
Extractum Anthemidis	2 gr. to 10 gr.
Extractum Belæ Liquidum	1 fl. drm. to 2 fl. drm.
Extractum Belladonnæ	$\frac{1}{4}$ gr. to 1 gr.
Extractum Calumbæ	2 gr. to 10 gr.
Extractum Cannabis Indicæ	$\frac{1}{4}$ gr. to 1 gr.
Extractum Cinchonæ Flavæ Liquidum	10 min. to 30 min.
Extractum Colchici	$\frac{1}{2}$ gr. to 2 gr.
Extractum Colchici Aceticum	$\frac{1}{2}$ gr. to 2 gr.
Extractum Colocynthidis Compositum	3 gr. to 10 gr.

Extractum Conii	2 gr. to 6 gr.
Extractum Ergotæ Liquidum	10 min. to 30 min.
Extractum Filicis Liquidum	15 min. to 30 min.
Extractum Gentianæ	2 gr. to 10 gr.
Extractum Glycyrrhizæ	10 gr. to 30 gr.
Extractum Hæmatoxyli	10 gr. to 30 gr.
Extractum Hyoscyami	5 gr. to 10 gr.
Extractum Jalapæ	5 gr. to 15 gr.
Extractum Krameriæ	5 gr. to 20 gr.
Extractum Lactucæ	5 gr. to 15 gr.
Extractum Lupuli	5 gr. to 15 gr.
Extractum Nucis Vomicæ	½ gr. to 2 gr.
Extractum Opii	½ gr. to 2 gr.
Extractum Opii Liquidum	10 min. to 40 min.
Extractum Papaveris	2 gr. to 5 gr.
Extractum Pareiræ	10 gr. to 20 gr.
Extractum Pareiræ Liquidum	½ fl. drm. to 2 fl. drm.
Extractum Physostigmatis	1/16 gr. to ¼ gr.
Extractum Quassiæ	3 gr. to 5 gr.
Extractum Rhei	5 gr. to 15 gr.
Extractum Sarsæ Liquidum	2 fl. drm. to 4 fl. drm
Extractum Stramonii	¼ gr. to ½ gr.
Extractum Taraxaci	5 gr. to 30 gr.
Fel Bovinum (purif.)	5 gr. to 10 gr.
Ferri Arsenias	1/16 gr. to ½ gr.
Ferri Carbonas Saccharata	5 gr. to 20 gr.
Ferri et Ammoniæ Citras	5 gr. to 10 gr.
Ferri et Quiniæ Citras	5 gr. to 10 gr.
Ferri Iodidum	1 gr. to 5 gr.
Ferri Oxidum Magneticum	5 gr. to 10 gr.
Ferri Perchloridi Liquor	3 min. to 10 min.
Ferri Pernitratis Liquor	30 min. to 1 fl. drm.
Ferri Peroxidum	10 gr. to 60 gr. or more.
Ferri Peroxidum Humidum	¼ oz. to ½ oz.
Ferri Peroxidum Hydratum	5 gr. to 30 gr.
Ferri Phosphas	5 gr. to 10 gr.
Ferri Sulphas	1 gr. to 5 gr.
Ferri Sulphas Exsiccata	½ gr. to 3 gr.
Ferri Sulphas Granulata	1 gr. to 5 gr.
Ferrum Redactum	1 gr. to 5 gr.
Ferrum Tartaratum	5 gr. to 10 gr.
Filix (of the powdered root)	60 gr. to 120 gr.
Galbanum (the gum resin)	10 gr. to 30 gr.
Gentiana (in powder)	10 gr. to 30 gr.

Glycerinum	1 fl. drm. to 2 fl. drm.
Guiacum (the powdered resin)	10 gr. to 30 gr.
Hydrargyri Perchloridum	$\frac{1}{16}$ gr. to $\frac{1}{8}$ gr.
Hydrargyri Subchloridum	$\frac{1}{2}$ gr. to 5 gr.
Hydrargyri Sulphuretum (for fumigation)	30 gr. and upwards.
Hydrargyrum cum Cretâ	3 gr. to 8 gr.
Hydrargyrum Iodidum Rubrum	$\frac{1}{16}$ gr. to $\frac{1}{4}$ gr.
Hydrargyrum Iodidum Viride	1 gr. to 3 gr.
Infusum Anthemidis	1 fl. oz. to 4 fl. oz.
Infusum Aurantii	1 fl. oz. to 2 fl. oz.
Infusum Aurantii Compositum	1 fl. oz. to 2 fl. oz.
Infusum Buchu	1 fl. oz. to 4 fl. oz.
Infusum Calumbæ	1 fl. oz. to 2 fl. oz.
Infusum Caryophylli	1 fl. oz. to 4 fl. oz.
Infusum Cascarillæ	1 fl. oz. to 2 fl. oz.
Infusum Catechu	1 fl. oz. to 2 fl. oz.
Infusum Chiratæ	1 fl. oz. to 2 fl. oz.
Infusum Cinchonæ Flavæ	1 fl. oz. to 2 fl. oz.
Infusum Cuspariæ	4 fl. oz. to 2 fl. oz.
Infusum Cusso	4 fl. oz. to 8 fl. oz.
Infusum Digitalis	2 fl. drm. to 4 fl. drm.
Infusum Dulcamaræ	1 fl. oz. to 2 fl. oz.
Infusum Ergotæ	1 fl. oz. to 2 fl. oz.
Infusum Gentianæ Compositum	1 fl. oz. to 2 fl. oz.
Infusum Krameriæ	1 fl. oz. to 2 fl. oz.
Infusum Lini	ad libitum.
Infusum Lupuli	1 fl. oz. to 2 fl. oz.
Infusum Maticæ	1 fl. oz. to 2 fl. oz.
Infusum Quassiæ	1 fl. oz. to 2 fl. oz.
Infusum Rhei	1 fl. oz. to 2 fl. oz.
Infusum Rosæ Acidum	1 fl. oz. to 2 fl. oz.
Infusum Senegæ	1 fl. oz. to 2 fl. oz.
Infusum Sennæ	1 fl. oz. to 2 fl. oz.
Infusum Serpentariæ	1 fl. oz. to 2 fl. oz.
Infusum Uvæ Ursi	1 fl. oz. to 2 fl. oz.
Infusum Valerianæ	1 fl. oz. to 2 fl. oz.
Inula (in powder)	30 gr. to 60 gr.
Iodum	$\frac{1}{2}$ gr., gradually increased.
Ipecacuanha (in powder, as an emetic)	15 gr. to 30 gr.
Ipecacuanha (in powder, as an expectorant)	$\frac{1}{2}$ gr. to 2 gr.
Jalapa (powder)	10 gr. to 30 gr.
Jalapæ Resina	2 gr. to 5 gr.
Kamela	30 gr. to $\frac{1}{4}$ oz.

Kino (in powder)	10 gr. to 30 gr.
Krameria (in powder)	20 gr. to 60 gr.
Lactucarium	5 gr. to 30 gr.
Liquor Ammoniæ	10 min. to 30 min.
Liquor Ammoniæ Acetatis	2 fl. drm. to 6 fl. drm.
Liquor Ammoniæ Citratis	2 fl. drm. to 6 fl. drm.
Liquor Ammoniæ Fortior	3 min. to 10 min., freely diluted.
Liquor Arsenicalis	2 min. to 8 min.
Liquor Arsenici et Hydrargyri Hydriodatis (Donovan's solution)	10 min. to ½ fl. drm.
Liquor Arsenici Hydrochloricus	2 min. to 8 min.
Liquor Bismuthi et Ammoniæ Citratis	½ fl. drm. to 1 fl. drm.
Liquor Calcis	1 fl. oz. to 4 fl. oz.
Liquor Calcis Saccharatus	15 min. to 60 min.
Liquor Chlori	10 min. to 20 min.
Liquor Ferri Perchloridi	10 min. to 30 min.
Liquor Ferri Pernitratis	10 min. to 40 min.
Liquor Hydrargyri Perchloridi	½ fl. drm. to 2 fl. drm.
Liquor Lithiæ Effervescens	5 fl. oz. to 10 fl. oz.
Liquor Magnesiæ Carbonatis	1 fl. oz. to 2 fl. oz.
Liquor Morphiæ Acetatis	10 min. to 60 min.
Liquor Morphiæ Hydrochloratis	10 min. to 60 min.
Liquor Potassæ	15 min. to 60 min.
Liquor Potassæ Effervescens	5 fl. oz. to 10 fl. oz.
Liquor Potassæ Permanganatis	2 fl. drm. to 4 fl. drm.
Liquor Sodæ	10 min. to 1 fl. drm.
Liquor Sodæ Arseniatis	5 min. to 10 min.
Liquor Sodæ Chlorate	10 min. to 20 min.
Liquor Sodæ Effervescens	5 fl. oz. to 10 fl. oz.
Liquor Strychniæ	5 min. to 10 min.
Lithiæ Carbonas	3 gr. to 6 gr.
Lithiæ Citras	5 gr. to 10 gr.
Lupulin	5 gr. to 10 gr.
Magnesia	10 gr. to 60 gr.
Magnesiæ Carbonas	10 gr. to 60 gr.
Magnesiæ Carbonas Levis	10 gr. to 60 gr.
Magnesiæ Sulphas	60 gr. to ½ oz. or more.
Manganesii Sulphas (as a purgative)	60 gr. to 120 gr.
Manna	60 gr. to 1 oz.
Mastiche (resin, in powder)	20 gr. to 40 gr.
Matico (in powder)	30 gr. to 60 gr.
Mistura Ammoniaci	½ fl. oz. to 1 fl. oz.
Mistura Amygdalæ	1 fl. oz. to 2 fl. oz.

Mistura Creasoti	1 fl. oz. to 2 fl. oz.
Mistura Cretæ	1 fl. oz. to 2 fl. oz.
Mistura Ferri Aromatica	1 fl. oz. to 2 fl. oz.
Mistura Ferri Composita	1 fl. oz. to 2 fl. oz.
Mistura Gentianæ	½ fl. oz. to 1 fl. oz.
Mistura Guaiaci	½ fl. oz. to 2 fl. oz.
Mistura Scammonii	½ fl. oz. to 2 fl. oz. (for a child).
Mistura Sennæ Composita	1 fl. oz. to 1½ fl. oz.
Mistura Spiritûs Vini Gallici	1 oz. to 2 oz.
Morphiæ Acetas	⅛ gr. to ½ gr.
Morphiæ Hydrochloras	⅛ gr. to ½ gr.
Moschus	5 gr. to 10 gr.
Mucilago Acaciæ	ad libitum.
Mucilago Tragacanthæ	1 fl. oz. and upwards.
Myristica (in powder)	5 gr. to 15 gr.
Myrrh (in powder)	10 gr. to 30 gr.
Nux Vomica (in powder)	1 gr. to 3 gr.
Oleum Amygdalæ	1 fl. drm. to ½ fl. oz.
Oleum Anethi	1 min. to 5 min.
Oleum Anisi	1 min. to 5 min.
Oleum Anthemidis	1 min. to 5 min.
Oleum Cajuputi	1 min. to 5 min.
Oleum Carui	1 min. to 5 min.
Oleum Caryophylli	1 min. to 5 min.
Oleum Cinnamomi	1 min. to 5 min.
Oleum Copaibæ	5 min. to 20 min.
Oleum Coriandri	1 min. to 5 min.
Oleum Crotonus	⅓ min. to 1 min.
Oleum Cubebæ	5 min. to 20 min.
Oleum Juniperi	1 min. to 10 min.
Oleum Lavandulæ	1 min. to 5 min.
Oleum Limonis	1 min. to 5 min.
Oleum Menthæ Piperitæ	1 min. to 5 min.
Oleum Menthæ Viridis	1 min. to 5 min.
Oleum Morrhuæ	1 fl. drm. to 8 fl. drm.
Oleum Myristicæ	1 min. to 5 min.
Oleum Olivæ	1 fl. drm. to 1 fl. oz.
Oleum Pimentæ	1 min. to 5 min.
Oleum Pulegii	1 min. to 5 min.
Oleum Ricini	1 fl. drm. to 8 fl. drm.
Oleum Rosmarini	1 min. to 5 min.
Oleum Rutæ	1 min. to 5 min.
Oleum Sabinæ	1 min. to 5 min.

Oleum Sassafras	1 min. to 5 min.
Oleum Terebinthinæ (as a stimulant and diuretic)	10 min. to 20 min.
Oleum Terebinthinæ (as an anthelmintic purgative)	2 fl. drm. to 6 fl. drm.
Opium (powdered)	½ gr. to 2 gr.
Oxymel	1 fl. drm. to 2 fl. drm.
Oxymel Scillæ	½ fl. drm. to 1 fl. drm.
Pareira (in powder)	30 gr. to 60 gr.
Pepsina	15 gr. to 20 gr.
Pepsina Porci	2 gr. to 4 gr.
Petroleum	30 min. to 1 fl. drm.
Phosphorus	$\frac{1}{40}$ gr. to $\frac{1}{10}$ gr.
Pilula Aloes Barbadensis	5 gr. to 10 gr.
Pilula Aloes et Assafœtidæ	6 gr. to 10 gr.
Pilula Aloes et Ferri	5 gr. to 10 gr.
Pilula Aloes et Myrrhæ	5 gr. to 10 gr.
Pilula Aloes Socotrinæ	5 gr. to 10 gr.
Pilula Assafœtidæ Composita	5 gr. to 10 gr.
Pilula Cambogiæ Composita	5 gr. to 10 gr.
Pilula Colocynthidis Composita	5 gr. to 10 ge.
Pilula Colocynthidis et Hyoscyami	5 gr. to 10 gr.
Pilula Conii Composita	5 gr. to 10 gr.
Pilula Ferri Carbonatis	5 gr. to 20 gr.
Pilula Ferri Iodidi	3 gr. to 8 gr.
Pilula Hydrargyri	3 gr. to 8 gr.
Pilula Hydrargyri Subchloridi Composita	5 gr. to 10 gr.
Pilula Ipecacuanhæ cum Scilla	5 gr. to 10 gr.
Pilula Plumbi cum Opio	3 gr. to 5 gr.
Pilula Quiniæ	2 gr. to 10 gr.
Pilula Rhei Composita	5 gr. to 10 gr.
Pilula Saponis Composita	3 gr. to 5 gr.
Pilula Scillæ Composita	5 gr. to 10 gr.
Pimenta (powder)	5 gr. to 20 gr.
Piper (nigrum)	5 gr. to 10 gr.
Piperina	5 gr. to 10 gr.
Plumbi Acetas	1 gr. to 4 gr.
Plumbi Iodidum	¼ gr. to 1 gr.
Podophyllum (in powder)	10 gr. to 20 gr.
Podophylli Resina (Podophylline)	¼ gr. to 1 gr.
Potassa Sulphurata	3 gr. to 6 gr. freely diluted.
Potassæ Acetas	10 gr. to 20 gr.
Potassæ Bicarbonas	10 gr. to 40 gr.

Potassæ Carbonas	10 gr. to 30 gr.
Potassæ Chloras	10 gr. to 30 gr.
Potassæ Citras	20 gr. to 60 gr.
Potassæ Nitras	10 gr. to 30 gr.
Potassæ Sulphas (as a purgutive)	15 gr. to 60 gr.
Potassæ Tartras	60 gr. to ½ oz.
Potassæ Tartras Acida	20 gr. to 60 gr.
Potassii Bromidum	5 gr. to 30 gr.
Potassii Iodidum	2 gr. to 10 gr.
Pulvis Amygdalæ Compositus	60 gr. to 120 gr.
Pulvis Antimonialis	3 gr. to 10 gr.
Pulvis Aromaticus	10 gr. to 30 gr.
Pulvis Catechu Compositus	20 gr. to 40 gr.
Pulvis Cretæ Aromaticus	10 gr. to 60 gr.
Pulvis Cretæ Aromaticus cum Opio	10 gr. to 40 gr.
Pulvis Ipecacuanhæ Compositus	5 gr. to 15 gr.
Pulvis Jalapæ Compositus	20 gr. to 60 gr.
Pulvis Kino Compositus	5 gr. to 20 gr.
Pulvis Opii Compositus	2 gr. to 5 gr.
Pulvis Rhei Compositus	20 gr. to 60 gr.
Pulvis Scammonii Compositus	10 gr. to 20 gr.
Pulvis Tragacanthæ Compositus	20 gr. to 60 gr.
Quassia (in powder)	10 gr. to 20 gr.
Quiniæ Sulphas	1 gr. to 10 gr.
Quiniæ Valerianas	1 gr. to 5 gr.
Rhei Radix	5 gr. to 20 gr.
Rhus Toxicodendron (powdered leaves)	½ gr. to 1 gr.
Ruta (powdered leaves)	20 gr. to 40 gr.
Sabinæ Cacumina	4 gr. to 10 gr.
Sagapenum (the gum resin)	10 gr. to 30 gr.
Santonica (worm seed)	10 gr. to 60 gr.
Santoninum (Santonin—crystallized)	2 gr. to 6 gr.
Sapo Durus, or Sapo Mollis (as antacids)	5 gr. to 20 gr.
Scammoniæ Resina	3 gr. to 8 gr.
Scammonium (gum resin in powder)	5 gr. to 10 gr.
Scilla	1 gr. to 3 gr.
Senega (in powder)	20 gr. to 60 gr.
Senna (powdered leaves)	30 gr. to 120 gr.
Serpentaria (in powder)	10 gr. to 20 gr.
Simarubra (in powder)	15 gr. to 30 gr.
Sinapis (as an emetic)	from a dessert to a table-spoonful
Soda Taratarata	¼ oz. to ½ oz.

Sodæ Acetas	20 gr. to 60 gr.
Sodæ Arsenias	$\frac{1}{16}$ gr. to $\frac{1}{8}$ gr.
Sodæ Biboras	10 gr. to 60 gr.
Sodæ Bicarbonas	10 gr. to 60 gr.
Sodæ Carbonas	5 gr. to 30 gr.
Sodæ Carbonas Exsiccata	3 gr. to 10 gr.
Sodæ Citro-tartras Effervescens	60 gr. to $\frac{1}{4}$ oz.
Sodæ Phosphas	$\frac{1}{4}$ oz. to 1 oz.
Sodæ Sulphas	$\frac{1}{4}$ oz to 1 oz.
Sodæ Sulphis	20 gr. to 60 gr.
Sodæ Valerianas	1 gr. to 5 gr.
Spigelia (in powder)	60 gr. to 120 gr.
Spiritus Ætheris	30 min. to 90 min.
Spiritus Ætheris Nitrosi	30 min. to 2 fl. drm.
Spiritus Ammoniæ Aromaticus	30 min. to 1 fl. drm.
Spiritus Ammoniæ Fœtitus	$\frac{1}{2}$ fl. drm. to 1 fl. drm.
Spiritus Armoraciæ Compositus	1 fl. drm. to 2 fl. drm.
Spiritus Cajuputi	$\frac{1}{2}$ fl. drm. to 1 fl. drm.
Spiritus Camphoræ	10 min. to 30 min.
Spiritus Chloroformi (Chloric Ether)	20 min. to 60 min.
Spiritus Juniperi	$\frac{1}{2}$ min. to $1\frac{1}{2}$ fl. drm.
Spiritus Lavandulæ	$\frac{1}{2}$ fl. drm. to 1 fl. drm.
Spiritus Menthæ Piperitæ	30 min. to 60 min.
Spiritus Myristicæ	30 min. to 60 min.
Spiritus Rosmarini	10 min. to 50 min.
Staphisagria	3 gr. to 10 gr.
Stramonium (the leaves powdered)	1 gr. upwards.
Strychnia	$\frac{1}{30}$ gr. to $\frac{1}{12}$ gr.
Styrax Præparatus	5 gr. to 20 gr.
Succus Limonis	1 fl. drm. to 4 fl. drm.
Succus Scoparii	1 fl. drm. to $\frac{1}{2}$ fl. oz.
Succus Conii	30 min. to 60 min.
Succus Scoparii	1 fl. drm. to 2 fl. drm.
Succus Taraxaci	1 fl. drm. to 2 fl. drm.
Succus Mori	ad libitum.
Sulphide of Ammonium	3 min.
Sulphuris Iodidum	$\frac{1}{2}$ gr. to 2 gr.
Sulphur Præcipitatum	20 gr. to 1 drm.
Sulphur Sublimatum	20 gr. to 1 drm.
Sumbul (in powder)	20 gr. to 60 gr.
Syrupus	ad libitum
Syrupus Althæ	1 fl. drm. to 1 fl. oz.
Syrupus Aurantii	1 fl. drm.
Syrupus Aurantii Floris	1 fl. drm.

Syrupus Ferri Iodidi	½ fl. drm. to 1 fl. drm.
Syrupus Ferri Phosphatis	1 fl. drm.
Syrupus Hemidesmi	1 fl. drm.
Syrupus Limonis	1 fl. drm.
Syrupus Mori	1 fl. drm.
Syrupus Papaveris	1 fl. drm.
Syrupus Rhamni	1 fl. drm.
Syrupus Rhei	1 fl. drm. to 4 fl. drm.
Syrupus Rhœados	1 fl. drm.
Syrupus Rosæ Gallicæ	1 fl. drm.
Syrupus Scillæ	½ fl. drm. to 1 fl. drm.
Syrupus Sennæ	1 fl. drm. to 4 fl. drm.
Syrupus Tolutanus	1 fl. drm.
Syrupus Violæ	½ fl. drm. to 2 fl. drm.
Syrupus Zingiberis	1 fl. drm.
Tamarindus	½ oz. and upwards.
Tinctura Aconiti	5 min to 15 min.
Tinctura Actæa Racemosæ	30 min. to 60 min.
Tinctura Aloes	1 fl. drm. to 2 fl. drm.
Tinctura Arnicæ	1 fl. drm. to 2 fl. drm.
Tinctura Assafœtidæ	½ fl. drm. to 1 fl. drm.
Tinctura Aurantii	1 fl. drm. to 2 fl. drm.
Tinctura Belladonnæ	5 min. to 20 min.
Tinctura Benzoini Composita	½ fl. drm. to 1 fl. drm.
Tinctura Buchu	1 fl. drm. to 2 fl. drm.
Tinctura Calumbæ	½ fl. drm. to 1 fl. drm.
Tinctura Camphoræ Composita	15 min. to 1 fl. drm.
Tinctura Cannabis Indicæ	5 min. to 20 min.
Tinctura Cantharidis	5 min. to 20 min.
Tinctura Capsici	10 min. to 20 min.
Tinctura Cardamomi Composita	½ fl. drm. to 2 fl. drm.
Tinctura Cascarillæ	½ fl. drm. to 2 fl. drm.
Tinctura Castorei	½ fl. drm. to 1 fl. drm.
Tinctura Catechu	½ fl. drm. to 2 fl. drm.
Tinctura Chiratæ	½ fl. drm. to 2 fl. drm.
Tinctura Chloroformi Composita	20 min. to 60 min.
Tinctura Cinchonæ Composita	½ fl. drm. to 2 fl. drm.
Tinctura Cinchonæ Flavæ	½ fl. drm. to 2 fl. drm.
Tinctura Cinnamomi	½ fl. drm. to 2 fl. drm.
Tinctura Cocci	½ fl. drm. to 2 fl. drm.
Tinctura Colchici Seminum	10 min. to 30 min.
Tinctura Conii	20 min. to 60 min.
Tinctura Croci	½ drm. to 1½ drm.
Tinctura Cubebæ	½ fl. drm. to 2 fl. drm.

Tinctura Digitalis	10 min. to 30 min.
Tinctura Ergotæ	10 min. to 1 fl. drm.
Tinctura Ferri Acetatis	5 min. to 30 min.
Tinctura Ferri Perchloridi	10 min. to 30 min.
Tinctura Gallæ	½ fl. drm. to 2 fl. drm.
Tinctura Gentianæ Composita	½ fl. drm. to 2 fl. drm.
Tinctura Guaiaci Ammoniata	½ fl. drm. to 1 fl. drm.
Tinctura Hellebori (*Lond.*, 1851)	30 min. to 1 fl. drm.
Tinctura Hyoscyami	½ fl. drm. to 1 fl. drm.
Tinctura Iodi	5 min. to 20 min.
Tinctura Jalapæ	½ fl. drm. to 2 fl. drm.
Tinctura Kino	½ fl. drm. to 2 fl. drm.
Tinctura Krameriæ	½ fl. drm. to 2 fl. drm.
Tinctura Lavandulæ Composita	½ fl. drm. to 2 fl. drm.
Tinctura Limonis	½ fl. drm. to 2 fl. drm.
Tinctura Lobeliæ	10 min. to ½ fl. drm.
Tinctura Lobeliæ Ætherea	10 min. to ½ fl. drm.
Tinctura Lupuli	½ fl. drm. to 1 fl. drm.
Tinctura Myrrhæ	½ fl. drm. to 1 fl. drm.
Tinctura Nucis Vomicæ	10 min. to 20 min.
Tinctura Opii	5 min. to 40 min.
Tinctura Opii Ammoniata	½ fl. drm. to 1 fl. drm.
Tinctura Quassiæ	½ fl. drm. to 2 fl. drm.
Tinctura Quiniæ	½ fl. drm. to 2 fl. drm.
Tinctura Rhei (as a stomachic)	1 fl. drm. to 2 fl. drm.
Tinctura Rhei (as a purgative)	4 fl. drm. to 8 fl. drm.
Tinctura Sabinæ	20 min. to 1 fl. drm.
Tinctura Scillæ	10 min. to 30 min.
Tinctura Senegæ	½ fl. drm. to 2 fl. drm.
Tinctura Sennæ	1 fl. drm. to 4 fl. oz.
Tinctura Serpentariæ	½ fl. drm. to 2 fl. drm.
Tinctura Stramonii	10 min. to 30 min.
Tinctura Sumbul	10 min. to 30 min.
Tinctura Tolutana	20 min. to 40 min.
Tinctura Valerianæ	1 fl. drm. to 2 fl. drm.
Tinctura Valerianæ Ammoniata	½ fl. drm. to 1 fl. drm.
Tinctura Veratri Viridis	5 min. to 20 min.
Tinctura Zingeberis	15 min. to 1 fl. drm.
Tinctura Zingeberis Fortior	5 min. to 20 min.
Tormentilla (in powder)	20 gr. to 60 gr.
Tragacantha (powder)	20 gr. and upwards.
Trochisci Acidi Tannici	*one* to *six*.
Trochisci Bismuthi	*one* to *six*.
Trochisci Catechu	*one* to *six*.

Trochisci Ferri Redacti	*one* to *six.*
Trochisci Ipecacuanhæ	*one* to *three.*
Trochisci Morphiæ	*one* to *six.*
Trochisci Morphiæ et Ipecacuanhæ	*one* to *six.*
Trochisci Opii	*one* to *six.*
Trochisci Potassæ Chloratis	*one* to *six.*
Trochisci Sodæ Bicarbonatis	*one* to *six.*
Uva Ursæ (powdered leaves)	10 gr. to 30 gr.
Valeriana (in powder)	10 gr. to 30 gr.
Veratria (the alkaloid)	$\frac{1}{12}$ gr. to $\frac{1}{6}$ gr.
Veratrum Viride (powdered rhizome)	1 gr. to 3 gr.
Vinum Aloes	1 fl. drm. to 2 fl. drm.
Vinum Antimoniale (in febrile affections	5 min. to 1 fl. drm. (?)
Vinum Antimoniale (as an emetic)	$\frac{1}{2}$ fl. oz. to 1 fl. oz.
Vinum Colchici	10 min. to 30 min.
Vinum Ferri	1 fl. drm. to 4 fl. drm.
Vinum Ferri Citratis	1 fl. drm. to 4 fl. drm.
Vinum Ipecacuanhæ (as an expectorant)	5 min. to 40 min.
Vinum Ipecacuanhæ (as an emetic)	3 fl. drm. to 6 fl. drm.
Vinum Opii	10 min. to 40 min.
Vinum Quiniæ	$\frac{1}{2}$ fl. oz. to 1 fl. oz.
Vinum Rhei	1 drm. to 2 drm.
Vinum Veratri (*Lond.*, 1851)	10 min. to 20 min.
Zincic Acetas	1 gr. to 2 gr.
Zincic Acetas (as an emetic)	10 gr. to 20 gr.
Zinci Carbonas	1 gr. to 5 gr. or more.
Zinci Chloridum	$\frac{1}{2}$ gr. to 1 gr. or 2 gr.
Zinci Oxidum	2 gr. to 10 gr.
Zinci Sulphas (as a tonic or astringent)	1 gr. to 2 gr.
Zinci Sulphas (as an emetic)	10 gr. to 30 gr.
Zinci Valerianas	1 gr. to 3 gr.
Zingiber (in powder)	10 gr. to 30 gr.

DIETARY FOR INVALIDS.

Macaroni Soup.

One ounce and a half of macaroni, a piece of butter the size of a nut, salt to taste, one quart of stock.

Throw the macaroni and butter into boiling water, with a pinch of salt, and simmer half an hour. When tender, drain, and cut it into thin rings or lengths, and drop it into the boiling soup. Stew gently fifteen minutes, and serve.

Barley Soup.

One pound of shin of beef, four ounces of pearl barley, one potato, salt and pepper to taste, one quart and a half of water.

Put all the ingredients into a pan, and simmer gently for four hours. Strain, return the barley, and heat up as much as required. A small onion may be added, if not objected to.

Bread Soup.

One pound of bread, two ounces of butter, one quart of stock.

Boil the bread with the butter in stock. Beat the whole with a spoon or fork, and keep it boiling till the bread and stock are thoroughly mixed. Strain, season with salt, and serve.

Tapioca Soup.

Two ounces and a half of tapioca, one quart of stock.

Put the tapioca into *cold* stock, and bring it gradually to the boiling point. Simmer gently till tender, and serve.

Sardinian Soup.

Two eggs, a quarter of a pint of cream, one ounce of fresh butter, salt and pepper to taste, a little flour to thicken.

Beat the eggs, put them into a stewpan, and add the cream, butter, and seasoning, stir in as much flour as will bring it to the consistency of dough, make it into balls the size and shape of a nut, fry in butter, and put them into a basin of any sort of soup or broth, to which they make a very nice addition.

Stewed Oysters.

Half a pint of oysters, half an ounce of butter, flour, one-third of a pint of cream, cayenne and salt to taste.

Scald the oysters in their own liquor, take them out, beard them, and strain the liquor. Put the butter into a stewpan, dredge in sufficient flour to dry it up, add the oyster liquor, and stir it over a sharp fire with a wooden spoon. When it boils, add the cream, oysters, and seasoning, and simmer for one or two minutes, but *not longer*, or the oysters will harden. Serve on a hot dish, with croutons or toasted sippets of bread. A quarter of a pint of oysters, the other ingredients being in proportion, make a dish large enough for one person.

Panada.

Take the crumbs of a penny roll, and soak it in milk for half an hour, then squeeze the milk from it; have ready an equal quantity of chicken or veal, *scraped* very fine with a knife; pound the bread crumbs and meat together in a mortar. It may be cooked either mixed with veal or chicken broth, or poached like an egg, by taking it up in two tea-spoons, in pieces the shape of an egg, after seasoning it. Serve on mashed potato.

Macaroni.

Two ounces of macaroni, a quarter of a pint of milk, a quarter of a pint of good beef gravy, the yolk of one egg, two table-spoonfuls of cream, half an ounce of butter. Wash the macaroni, and boil it in the gavy and milk till *quite* tender. Drain it, put the macaroni into a very hot dish, and place by the fire. Beat the yolk of the egg with the cream and two table-spoonfuls of the liquor the macaroni was boiled in. Make this sufficiently hot to thicken, *but do not allow it to boil*, or it will be spoiled; pour it over the macaroni, and grate over the whole a little finely grated Parmasan cheese; or the macaroni may be served as an accompaniment to minced beef, without the cheese; or it may be taken alone, with some good gravy in a tureen, served with it.

Stewed Eels.

One eel, half a pint of strong stock, two table-spoonfuls of cream, half a glass of port wine, thickening of flour, a little cayenne.

Wash and skin the eel, cut it in pieces about two inches long; pepper and salt them, and lay them in a stewpan, pour over the stock, and add the wine. Stew gently for twenty-five minutes or half an hour, lift the pieces carefully on to a very hot dish, and place it by the fire; strain the gravy, stir into the cream sufficient flour to thicken it, mix with the gravy, boil for two minutes, and add a little cayenne. Pour over the eels, and serve. Sometimes the addition of a little lemon-juice is gratifying to the palate.

Minced Fowl and Egg.

Cold roast fowl, a hard-boiled egg, salt, pepper, or cayenne, to taste; three table-spoonfuls of new milk or cream, half an ounce of butter, one table-spoonful of flour, a tea-spoonful of lemon-juice.

Mince the fowl, and remove all skin and bones; put the bones, skin, and trimmings into a stewpan, with one small onion, if agreeable to the patient, and nearly half a pint of water; let this stew for an hour, then strain the liquor, chop the egg small, mix with the fowl, add salt and pepper, put in the gravy and other ingredients, let the whole just boil, and serve with sippets of toasted bread.

Fowl and Rice.

A quarter of a pound of rice, one pint of stock or broth, one ounce and a half of butter, minced fowl, egg, and bread crumbs.

Put the rice into the cold stock or broth, let it boil very gently for half an hour, then add the butter, and simmer it till quite dry and soft. When cold, make it into balls, hollow out the inside, and fill them with mince made according to the foregoing receipt, but a little stiffer; cover with rice, dip the balls into egg, sprinkle with bread crumbs, and fry a nice brown; a little cream stirred into the rice before it cools improves it very much.

Chicken and Rice.

Cut up the meat of boiled chicken. Have ready some rice well creed and seasoned with salt put round a small flat dish or vegetable dish, warm up the chicken in a little good gravy, and serve in the middle of the dish with the rice round it.

Macaroni boiled in Milk.

Two ounces of macaroni, three-quarters of a pint of new milk, a little lemon-rind, a little white sugar.

Put the milk into a saucepan with the lemon-rind, bring it to boiling point, and drop in the macaroni. Let it swell gradually over the fire till *quite* tender, but do not allow the pipes to break.

If not enough milk, add a little more. The lemon-peel should be taken out before the macaroni is put into the milk. Serve hot with fruit syrup, or cold with custard poured over it.

Rice Cream, 1.

To a pint of new milk add a quarter of a pound of ground rice, a lump of butter the size of a walnut, a little lemon-peel, and a table-spoonful of powdered sugar. Boil them together for five minutes, then add half an ounce of isinglass which has been dissolved, and let the mixture cool. When cool, add half a pint of good cream whisked to a froth, mix all together, and set it for a time in a very cool place, or on ice; when used, turn it out of the basin into a dish, and pour fruit juice round it, or some stewed apple or pear may be served with it.

Rice Cream, 2.

A quarter of a pound of whole rice, well creed in milk, and put in a sieve to drain and cool, mix with the rice a gill of good cream whisked to a froth, and add a wine-glass of sherry, a little powdered sugar, and a tea-spoonful of lemon-juice.

Light Pudding.

Boil very smoothly in new milk one table-spoonful of ground rice, let it get *quite cold*, then add two eggs, very well beaten up, a lump of white sugar, and, if liked, a dessert-spoonful of brandy. Line a small tart dish (sufficient for one person) with paste, put in the pudding, and bake quickly. Serve the moment it is ready, for it falls directly.

Rice and Apple.

Boil about three table-spoonfuls of rice in a pint and a half of new milk, and simmer, stirring it from time to time, till the rice is *quite* tender. Have ready some apples, peeled, cored, and stewed to a pulp, and sweetened with a very little loaf sugar. Put the rice round a plate, and the apple in the middle, and serve with a little of the following preparation of milk in a cream jug, if liked.

Milk for Puddings or Stewed Fruit.

Boil a strip of lemon and two cloves in a pint of milk; mix half a tea-spoonful of arrowroot in a little cold milk, and add it to the boiling milk; stir it till about the consistency of cream. Have ready the yolks of three eggs, beaten up well in a little milk. Take the hot milk off the fire, and as it cools add the eggs and a table-spoonful of orange-flower water, stirring it constantly till quite cool. Keep it in a very cold place till required for use.

Cream for Stewed Fruit.

An ounce and a half of isinglass boiled over a slow fire in a pint and a half of water, to half a pint. Strain and sweeten, put in a glass of sherry, and stir in half a pint of good cream; stir till cold.

Baked Custard Pudding.

Warm half a pint of milk, or a little more; whisk two eggs, yolks and whites; pour the milk to them, stirring all the while. Have ready a small tart dish, lined at the edges with paste ready baked. Pour the custard into the dish, grate a little nutmeg over the top, and bake it in a very slow oven for half an hour.

Boiled Custard Pudding.

Prepare the custard as in the foregoing receipt. Butter a small basin that will exactly hold it, put in the custard, and tie a floured cloth over it; plunge it into boiling water, turn it for about a few minutes, boil it slowly for half an hour, and turn it out, and serve.

Baked Bread Pudding.

Half a pint of new milk, a quarter of a pound of bread crumbs, two eggs, one ounce of butter, sugar to taste.

Boil the milk, and pour it over the bread crumbs, and let them soak for half an hour. Beat the eggs, mix them with the bread crumbs, add the sugar and butter, and stir well till thoroughly mixed. Butter a breakfast cup or small pudding mould, fill it a little more than half full with the mixture, and bake in a moderate oven for about twenty minutes. Serve with the following sauce.

Sago Sauce for Boiled or Baked Puddings.

One dessert-spoonful of sago, not quite half a pint of water, one table-spoonful of sherry, one tea-spoonful of lemon-juice, and a little lemon-rind, sugar to taste.

Wash the sago, then put it into a saucepan with the water and lemon-peel, let it simmer for ten minutes, then take out the lemon-peel, add the other ingredients, boil and serve.

Semolina Pudding.

One ounce of semolina, half a pint of milk, one ounce of butter, two eggs, sugar to taste.

Heat the milk, and mix with it the semolina, sugar, and butter; stir this over the fire for a few minutes; then take it off, and mix with it the eggs, which should be well beaten. Butter a small tart dish, line it with puff paste, put in the pudding, and bake in a slow oven.

Rice Pudding.

Two ounces of whole rice, three-quarters of a pint of milk, one ounce of butter, two eggs, sugar to taste, flavouring of lemon-peel.

Let the rice swell in the milk over a slow fire, put in a few small strips of lemon-peel, stir in the butter, and then let the mixture cool. Well beat the eggs, and mix with the rice. Butter a breakfast cup or small mould, fill it three parts full, and bake. Turn it out on a white d'oyley, and serve with sauce.

Rice Milk.

Three table-spoonfuls of rice, one quart of milk.

Wash the rice, put it in a saucepan with the milk, and simmer gently till the rice is tender, stirring it now and then to prevent the milk burning. Sweeten a little, and serve with a cut lemon, black-currant jam, or apples stewed.

Tapioca Pudding.

One ounce of tapioca, one pint of milk, one ounce of butter, two eggs, sugar to taste.

Wash the tapioca, and let it stew gently in the milk for a quarter of an hour, stirring it now and then. Let it cool. Mix with it the butter, sugar, and eggs, which must be well beaten; put it into a small tart dish, and give it an hour's baking in a moderate oven.

Apple and Rice.

Take three small apples, peel and halve them, take out the cores, put them into a stewpan with about half an ounce of butter, and strew over them a little white sifted sugar. Stew them very gently till tender, taking care not to break them. Boil the rice with the milk and a little sugar till quite soft; and when done, dish it with the apples on the top of it, and a little cream served with it separately.

Milk Blancmange.

Quarter of a pound of loaf sugar, one quart of milk, one ounce and a half of isinglass.

Put all the ingredients into a lined saucepan, and boil gently till the isinglass is dissolved. Keep stirring it over the fire for about ten minutes. Strain it through a fine sieve into a jug, and when nearly cold pour it into an oiled mould. Turn it carefully out when required for use.

Rice Blancmange.

A quarter of a pound of ground rice, two ounces of loaf sugar, one ounce of butter, one quart of milk, flavouring of lemon-peel.

Mix the rice to a smooth batter with a little milk, and put the remainder into a saucepan with the butter, sugar, and lemon-peel. Bring the milk to boiling point, stir in the rice. Let it boil for ten minutes, or till it comes away from the saucepan. Grease a mould with salad oil, pour in the rice, let it get perfectly cold, and turn out.

Arrowroot Blancmange.

Two table-spoonfuls of arrowroot, three-quarters of a pint of milk, lemon and sugar to taste.

Mix the arrowroot with a little milk to a smooth batter; put the rest of the milk on the fire, and let it boil, sweeten and flavour it, stirring all the time, till it thickens sufficiently to come from the saucepan. Put it into a mould till quite cold.

Vermicelli Pudding.

Two ounces of vermicelli, three-quarters of a pint of milk, quarter of a pint of cream, one ounce and a half of butter, two eggs, one ounce and a half of sugar.

Boil the vermicelli in the milk till it is tender, then stir in the remaining ingredients (omitting the cream if that is not obtainable). Butter a small tart dish, line with puff paste, put in the pudding, and bake.

Fruit Cream.

Apples, gooseberries, rhubarb, or any fresh fruit.

To every pint of pulp add one pint of milk or cream, sugar to taste. Prepare the fruit as for stewing, put it into a jar, with two table-spoonfuls of water, and a little good moist sugar. Set this jar in a saucepan of boiling water, and let it boil till the fruit is soft enough to mash. When done enough, beat it to a pulp, work this pulp through a colander, and to every pint stir in the above proportion of milk or cream. Of course the cream is preferable, if obtainable. Sweeten, and serve in a glass dish.

Bread Jelly.

Take the crumb of a loaf, break it up, pour boiling water over it, and leave it to soak for three hours. Then strain off the water, and add fresh; place the mixture on the fire, and let it boil till it is perfectly smooth; take it out, and, after pressing out the water, flavour with anything agreeable; put it into a mould, and turn it out when required for use.

Beef Tea and Cream Enema.

Mix four or five ounces of strong beef tea, one ounce of cream, and half an ounce of brandy or one ounce of port wine.

To keep Milk from turning sour.

Fifteen grains of bicarbonate of soda to a quart of milk hinders its turning sour.

Barley Water.

To a table-spoonful of pearl barley, washed in cold water, add two or three lumps of sugar, the rind of one lemon, and the juice of half a lemon. On these pour a quart of boiling water, and let it stand for seven or eight hours. Strain it. The barley should never be used a second time. Half an ounce of isinglass may be boiled in the water.

Lemonade 1.

Well rub two or three lumps of sugar on the rind of a lemon, squeeze out the juice, and add to it half a pint or a pint of cold or iced water, or, better still, one or two bottles of soda-water.

Effervescing Lemonade.

Squeeze two large lemons, and add a pint of spring water to the juice, and three or four lumps of white sugar. When required for use, pour half of it into a tumbler, and add half a small tea-spoonful of carbonate of soda; stir, and drink whilst effervescing.

Lemonade, 2.

The juice of four lemons, the rinds of two, half a pint of sherry, four eggs, six ounces of loaf sugar, one pint and a half of boiling water.

Pare the lemon-rind thinly, put it into a jug with the sugar, and pour the boiling water on it. Let it cool, and then strain it, and add the wine, lemon-juice, and eggs, previously well beaten and strained. Mix all well together, and it is ready for use.

Lemonade, 3.

Pare the rind of three lemons as thin as possible, add one quart of boiling water and a quarter of an ounce of isinglass. Let them stand till next day covered, then squeeze the juice of eight lemons upon half a pound of lump sugar; when the sugar is dissolved, pour the lemon and water upon it, mix well together, strain it, and it is ready for use.

Milk, Rum, and Isinglass.

Dissolve in a little hot water over the fire a pinch of the best isinglass; let it cool, and mix a dessert-spoonful of rum with it in a tumbler, and fill up the glass with new milk.

Sherry or Brandy and Milk.

To one table-spoonful of brandy, or one wine-glassful of sherry, in a bowl or cup, add powdered sugar and a very little nutmeg to taste. Warm a breakfast-cupful of new milk, and pour it into a spouted jug; pour the contents from a height over the wine, sugar, etc. *The milk must not boil.*

Mulled Wine.

Boil some spice, cloves, nutmeg, cinnamon, or mace, in a little water, just to flavour the wine; then add a wine-glass of sherry or any other wine, and some sugar, bring it to boiling point, and serve with sippets of toast. If claret is used, it will require a good deal of sugar. The vessel for boiling the wine in should be scrupulously clean.

Egg and Sherry.

Beat up with a fork an egg till it froths, add a lump of sugar and two table-spoonfuls of water; mix well, pour in a wine-glassful of sherry, and serve before it gets flat. Half the quantity of brandy may be used instead of sherry.

Milk, Egg, and Brandy.

Scald some new milk, *but do not let it boil.* It ought to be put into a saucepan of boiling water, in a jug, and scalded very gradually. When the surface looks filmy, it is sufficiently done, and should be put away in a cold place, in the same vessel. When quite cold, beat up a fresh egg with a fork, in a tumbler, with a lump of sugar; beat quite to a froth, add a dessert-spoonful of brandy, and fill up the tumbler with scalded milk.

Egg and Wine.

One egg, one table-spoonful and half a glass of cold water, one glass of sherry, sugar, and a *very* little grated nutmeg.

Beat the egg to a froth with a table-spoonful of cold water. Make the wine and water hot, *but not boiling;* pour it on the egg, stirring it all the time. Add sufficient sugar to sweeten, and a very little nutmeg. Put all into a lined saucepan, set it on a gentle fire, and stir it *one way* till it thickens, *but do not let it boil.* Serve in a glass with crisp biscuits or sippets of toast.

Arrowroot Drink.

Mix two tea-spoonfuls of arrowroot in about three table-spoonfuls of cold water, then pour in about half a pint of boiling water; when well mixed, add, by degrees, half a pint of cold water, stirring all the time, so as to make it perfectly smooth. It should be about the consistence of cream; if too thick, a little more water may be added. Then pour in two wine-glassfuls of sherry or one of brandy, add sugar to taste, and give it to the patient in a tumbler. A lump of ice may be added, if allowed.

Nutritious Coffee.

Dissolve a little isinglass in water, then put half an ounce of freshly ground coffee into a saucepan with one pint of new milk, which should be nearly boiling before the coffee is added, boil both together for three minutes; clear it by pouring some of it in a cup, and dashing it back again, add the isinglass, and leave it to settle on the hob for a few minutes. Beat up an egg in a breakfast cup, and pour the coffee into it; or, if preferred, drink it without the egg.

Milk and Isinglass.

Dissolve a little isinglass in water, mix it well with half a pint of milk, then boil the milk, and serve with or without sugar, as preferred.

Milk and Cinnamon Drink.

Boil in one pint of new milk sufficient cinnamon to flavour it pleasantly, and sweeten with white sugar. This may be taken cold with a tea-spoonful of brandy, and is very good in cases of diarrhœa. Children may take it milk-warm without the brandy.

Demulcent Drink.

Take a pinch of isinglass, and boil it in half a pint of new milk, with half a dozen bruised sweet almonds and three lumps of sugar.

Arrowroot and Black-Currant Drink.

Take two large spoonfuls of black-currant preserve, boil it in a quart of water, cover it, and stew gently for half an hour, then strain it, and set the liquor again on the fire; then mix a tea-spoonful of arrowroot in cold water, and pour the boiling liquor upon it, stirring meanwhile; then let it get quite cold.

White Wine Whey.

To half a pint of boiling milk add one or two wine-glassfuls of sherry; strain through a fine sieve, sweeten with sifted sugar, and serve.

Caudle.

Beat up an egg to a froth, add a wine-glassful of sherry, and half a pint of gruel, flavour with lemon-peel and nutmeg, and sweeten to taste.

Another Caudle.

Mix well together one pint of cold gruel with a wine-glassful of good cream, add a wine-glassful of sherry and a table-spoonful of noyeau, and sweeten with sugar-candy.

Egg and Brandy.

Beat up three eggs to a froth in four ounces of cold spring water, add two or three lumps of sugar, and pour in four ounces of brandy, stirring it all the time. A portion of this may be given at a time.

A Gruel.

Beat up an egg to a froth, add a wine-glass of sherry, flavour with a lump of sugar, a strip of lemon-peel, and a little grated nutmeg. Have ready some gruel, very smooth and hot, stir in the wine and egg, and serve with sippets of crisp toast. Arrowroot may be made in the same way.

Restorative Beef Essence, 1.

Take one pound of fresh beef, free from fat, chop it up fine, and pour over it eight ounces of soft water, add five or six drops of hydrochloric acid and fifty or sixty grains of common salt, stir it well, and leave it for three hours in a cool place. Then pass the fluid through a hair sieve, pressing the meat slightly, and adding gradually towards the end of the straining about two more ounces of water. The liquid thus obtained is of a red colour, possessing the taste of soup. It should be taken cold, a tea-cupful at a time. If preferred warm, it must not be put on the fire, but heated in a covered vessel placed in hot water.

Should it be undesirable for the patient to take the acid, this soup may be made by merely soaking the minced beef in distilled water.

Another Beef Essence, 2.

Take one pound of gravy beef, free from fat and skin, chop it up very fine, add a little salt, and put it into an earthen jar with a lid, fasten up the edges with a thick paste, such as is used for roasting venison in, and place the jar in the oven for three or four hours. Strain through a coarse sieve, and give the patient two or three tea-spoonfuls at a time.

Beef Essence, 3.

Cut up in small pieces one pound of lean beef from the sirloin or rump, and place it in a covered saucepan, with half a pint of cold water, by the side of the fire, for four or five hours, then allow it to simmer gently for two hours. Skim it well, and serve.

Mutton Jelly.

Six shanks of mutton, three pints of water, pepper and salt to taste, half a pound of lean beef, a crust of bread toasted brown.

Soak the shanks in water several hours, and scrub them well. Put the shanks, the beef, and other ingredients into a saucepan with the water, and let them simmer very gently for five hours. Strain it, and when cold take off the fat. Warm up as much as is wanted at a time.

Beef Tea with Oatmeal.

Mix two table-spoonfuls of oatmeal very smooth with two spoonfuls of cold water, then add a pint of strong boiling beef tea. Boil together for five or six minutes, stirring it well all the time. Strain it through a sieve, and serve.

Baked Soup.

One pound of lean beef, one ounce of rice, pepper and salt to taste, one pint and a half of water.

Cut up the meat into slices, add the rice and seasoning, place all in a jar with the water, cover it closely, and bake for four hours. Pearl barley may be substituted for rice, if preferred.

Mutton Broth.

One pound of the scrag end of neck of mutton, two pints of water, pepper and salt, half a pound of potatoes, or some pearl barley.

Put the mutton into a stewpan, pour the water over it, pepper and salt. When it boils, skim carefully; cover the pan, and let it simmer gently for an hour. Strain it, let it get cold, and then remove all the fat. When required for use, add some pearl barley or potatoes in the following manner:—Boil the potatoes, mash them very smoothly so that no lumps remain. Put the potatoes into a pan, and gradually add the mutton broth, stirring it till it is well mixed and smooth; let it simmer for five minutes, and serve with fried bread.

Soup.

Take three or four pared potatoes, a thick slice of bread, half a tea-cupful of pearl barley or rice, a little salt and pepper, two quarts of beef tea or mutton broth. Heat the beef tea or broth in a pan, and when quite boiling, add the rest of the ingredients, except the pepper and salt, which should be added when nearly done; cover the pan, and let it boil slowly for an hour. Serve with toasted bread.

Rabbit Soup.

Soak a rabbit in warm water, and when quite clean, cut it in pieces, and put it into a stewpan with a tea-cupful of veal stock or broth; simmer slowly till done through, then add a quart of water, and boil for an hour. Then take out the rabbit, pick the meat from the bones, covering it up to keep it white; put the bones back into the liquor, and simmer for two hours, skim and strain, and let it cool. Pound up the meat in a mortar, with the yolks of two hard-boiled eggs, and the crumb of a French roll, previously soaked in milk; rub it through a tammy, and gradually add the strained liquor, and simmer for fifteen minutes. If liked *thick*, mix some arrowroot with half a pint of new milk, bring it to the boil, mix with the soup, and serve. If preferred thin, have ready some pearl barley and vermicelli boiled in milk, and add to the soup instead of the arrowroot. Serve with little squares of toast or fried bread.

Calf's Foot Broth.

One calf's foot, three pints of water, one small lump of sugar, the yolk of one egg.

Stew the foot in water, *very gently*, till the liquor is reduced to half; remove the scum, set it in a basin till quite cold, then take off every particle of fat. Warm up about half a pint, adding the butter and sugar, take it off the fire for a minute or two, then add the beaten yolk of the egg; keep stirring it over the fire till the mixture thickens, *but do not let it boil*, or it will be spoiled.

Veal Soup.

A knuckle of veal, two cow-heels, twelve pepper-corns, a glass of sherry, and two quarts of water.

Stew all these ingredients in an earthen jar six hours. Do not open it till cold. When wanted for use, skim off the fat, and strain it. Heat as much as you require for use. Serve very hot.

Good Stock for Soup.

One pound of shin of beef, one pound of knuckle of veal, four white pepper-corns, a lump of sugar, one quart of water.

Simmer gently for six hours, skim well, and strain.

Nourishing Soup.

Stew two ounces of the best well-washed pearl sago in a pint of water till it is quite tender and very thick, then mix it with half a pint of good boiling cream and the yolks of two fresh eggs. Blend the whole carefully with one quart of essence of beef, made according to number 3. The beef essence must be heated separately, and mixed while both mixtures are hot. A little of this may be warmed up at a time.

Sago Soup, 2.

An ounce and a half of sago, one pint of stock.

Wash the sago in boiling water. Put one pint of stock on the fire, and bring it to the boil; add the sago by degrees, and simmer till it is entirely dissolved. When cold, it will form a jelly.

Rice Soup.

Three ounces of Patna rice, the yolks of two eggs, half a pint of cream or new milk, one quart of stock.

Boil the rice in the stock, and rub half of it through a tammy, put the stock in a stewpan, add the rest of the rice whole, and simmer gently for five minutes. Have ready the cream or milk, boiled. Beat the yolk of the eggs, and mix them gradually with the cream. Take the soup off the fire, add the cream and eggs, stirring them well together as you mix them. Heat it up gradually, but *do not let it boil,* or the eggs will curdle, and the soup be spoilt.

Semolina Soup.

Drop an ounce of semolina into one pint of boiling stock, and stir constantly to prevent burning. Simmer gently for half an hour. Season with salt to taste.

Thirst in fevers can be assuaged by the use of whey, or water acidulated with currant jelly or raspberry vinegar, or a light infusion of cascarilla, acidulated with a small quantity of muriatic acid.

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